Amateur Radio

JOURNAL OF THE WIRELESS INSTITUTE OF AUSTRALIA
VOL. 56, No 11, NOVEMBER 1988

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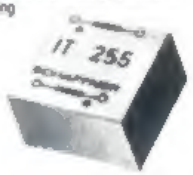

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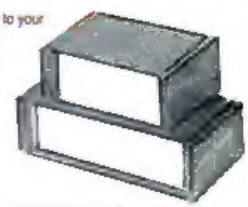

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Amateur Radio

Australia 1788-1988

Students in years 8 to 12 at Mentone Girls' Grammar School use computers whilst learning about satellites in physics, science and electronics lessons. They use some of the software programs written by AMSAT. Recently the girls followed the progress of the Russian-Canadian Skitrek Expedition via the satellites. The photograph shows Narelle Lamb, Brooke Fitcher, Catherine Prattico and Amanda Wilson during a lesson.

—Photograph courtesy Paul Butler VK3DBR Head of Science and Computing, Mentone Girls' Grammar School

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All copy for inclusion in the January 1989 issue of Amateur Radio, including regular columns and Hamads, must arrive at PO Box 300, Caulfield South, Vic. 3162, at the latest, by 9 am, November 7, 1988.

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EDITOR
BILL RICE* VK3ABP

NEWS EDITOR
JIM LINTON VK3PC

TECHNICAL EDITING CO-ORDINATOR
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TECHNICAL EDITORS
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CONTRIBUTING EDITORS
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Helen Wageningen

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Inquiries and material to:
The Editor,
PO Box 300,
Caulfield South, Vic. 3162.

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Editor's Comment

POSITIVE FEEDBACK

There are two concepts, both very basic to us in our use of electronics, which are far more generally widespread in their scope. There is, in fact, virtually no limit to their application. They are gain, and feedback.

Gain may be defined as a property, possessed by some systems, which enables a small stimulus applied at one point in the system to appear in larger, ie amplified, form at another point, these two points commonly being called input and output respectively.

Feedback is a process whereby some (possibly even all) of the output phenomenon (be it motion, temperature, voltage or whatever) is somehow transferred back to the input point. This, of course, can be done in two ways. If the fed-back signal opposes the original input, this is negative feedback. If it assists the input, the feedback is positive.

Negative feedback systems have a multitude of applications, but for the present let us concentrate only on positive feedback. The fed-back output increases the input, which in turn produces more output, so that the system continues to move off in this direction, as far and as fast as it can. In most cases it reaches a limit of some kind. For example, in the case of an explosive reaction it eventually runs out of fuel. In our electronic circuits the supply voltage imposes a limit, or a transformer core saturates (no more flux change, no more output). The process may then reverse direction until it reaches a limit of the opposite polarity. If so, we have a square-wave oscillator (although the transitions are more likely to be exponential curves than ideal squares).

Let us consider the stock market. The aim is to achieve profit by selling at a higher price than was paid, so one buys if the price is rising and tries to sell if it starts to fall. But prices rise because people are buying, and fall when they start to sell. Human reactions are slow; some may "hang on" even against logic. So we have over thousands of stocks a complex positive feedback system with time lags in the feedback paths. That such a system can maintain the stability it does, is itself amazing. In recent years computers have been introduced, programmed on-line to buy and sell automatically. Lacking human inhibitions, and operating much faster, it is not surprising that some have blamed this "program trading" for the stock market crash of October 1987, in which instead of conforming to an overall steady rise, average prices collapsed rapidly to the levels of a year or more earlier.

This normally expected steady rise in mean stock prices is necessary to compensate for yet another positive feedback phenomenon; inflation. This is the result of the so-called "wages-prices spiral", which devalues the currency as slowly as it does only because of various legal and procedural time delays inserted in its feedback path. To continue with the electronic analogy, it is as though each year we need a higher-voltage power supply than that which sufficed for the same job last year!

"Enough", you say, "We've been remarkably patient, but why don't you come to the point? Is there, in fact, a point at all?".

Yes, there certainly is! In this case, our positive feedback system is the Wireless Institute and all that it implies. Particularly this magazine. We, that is the Council and Executive, representing the Divisional Councils, provide as input to you, the membership, the dozens of organisational functions carried out by the WIA on your behalf, together with all the news and information we can assemble each month into AR.

You, in return, feed back into the system an amount of money, your annual subscription. Many of you, like me, also provide many hours of your time at no charge, to carry out the Institute's functions. The greater this feedback, the better are the functions performed. The magazine becomes more attractive and readable and more people are persuaded to join, which further boosts performance. A more attractive magazine with more readers appeals more to advertisers; yet another positive feedback boost to advertising income. The system moves in this direction until it encounters a limit, which in this case is when all Australian radio amateurs belong to the WIA. An unreasonable expectation, maybe, but it must be possible to improve greatly on our present less than half!

What is the other alternative? More members drop out, dissatisfied in some way. Less income is available, less work is done, the magazine becomes less attractive, advertisers lose interest, more members drop out. The limit in this case is for the WIA to disappear. Those of us doing the work will reorganise to make collapse impossible, but we cannot work miracles!

Positive feedback is inherent in the system. No-one can change its polarity. But those of you who are not at present members have the power to change its direction. How about it?

Bill Rice VK3ABP
Editor

ar

APPOINTMENT OF THE GENERAL MANAGER/SECRETARY

At the Federal Executive meeting on September 20, Bill Roper VK3ARZ, was appointed to the position of General Manager and Secretary of the Wireless Institute of Australia for a five-year term. Bill has been sitting in the chair in a temporary capacity since May 9.

The duties of the position centre around the management of the WIA Federal Office by:

- Controlling the financial interests of the Institute
- Analysing the Institutes services by using the results of surveys and other feedback from members
- Oversighting the performance of member service activities
- Negotiate and manage contracts on behalf of the Institute
- Represent the Institute at meetings and in negotiations with government, industrial and international bodies

The duties also include being the business manager for the Institutes publications and carry out the legal requirements of a company secretary.

The requirements for the position included a good knowledge of the role and objectives of the Institute and an appreciation of the roles of the Divisions, international bodies and government departments with whom the Institute interacts. Also required is a sound understanding and knowledge of business planning, forecasting, market research, service strategies and costing techniques applicable to the Institute's objectives and a knowledge and understanding of amateur radio and the services provided to members.

Amongst the personal characteristics sought is the need to lead and motivate a team of people, some of whom are volunteers, and highly developed communication and presentation skills. In addition, a high level of initiative and judgment, demonstrated capacity for innovative thought and significant accomplishments are required.

Bill is employed under a contract which contains the usual conditions for holidays, sick leave, hours of employment, reimbursement of out-of-pocket expenses and details the salary package. The initial base salary is aligned with that of a senior manager in the Public Service and has been set at $42 763. On top of this, at the Institute's discretion, a performance incentive payment may be made. This will be reviewed on an annual basis. There are also conditions for the extension and termination of the contract.

There is a very big task ahead as the Institute moves towards the 1990s. We must ensure that we become, and remain, a viable member oriented society. The Federal Executive have every confidence that Bill Roper is the right man to assist them in this task, but both Bill and the Executive need the help of you, the member to achieve this aim.

Peter Gamble VK3YRP
Federal President

BILL ROPER — a profile

Bill Roper is 52-years young, has a family of four daughters and three grandchildren.

Bill has spent 36 years in the banking industry, much of that time being spent in specialised areas such as administration, legal, accounting, personnel training and retail banking. He has completed a substantial number of training courses in a variety of subjects ranging from personnel and financial management, to negotiation and marketing.

In recent years he has held appointments at senior management level as a District Manager responsible for up to 36 bank branches, as Principal of a live-in Staff Training College, and as manager of a large retail banking branch office.

The call sign VK3ARZ is well-known to many amateurs and was first issued to Bill in 1959. Because of family and work pressures in recent years, his first love of designing and building receivers and transmitters has had to give way to finding ways and means of improving the performance of even the most sophisticated of commercial HF transceivers, and experimenting with antennas.

Bill, whose voice is familiar to amateurs because of the Federal Tapes over the past 12 years, has been actively involved in a number of aspects of the WIA, at both Divisional and Federal level, since 1960. Amongst the many positions, such as Victorian Divisional Councillor, and as a member of the Federal Executive, he was Editor of *Amateur Radio* magazine for several years in the 1970s.

Amateur radio is not Bill's only interest — he also has a particular interest in computers, especially when used as a tool for financial and administrative management. Other interests include reading, photography and light classical orchestral music.

In taking this position with the WIA, Bill has had to resign from his present employment, a move he did not take lightly. However, Bill, with the full support of his wife, Wyn, a schoolteacher, has made the move. "I could not resist the almost impossible challenges presented by the position of General Manager and Secretary of the WIA," Bill commented recently.

COIL DESIGN MADE EASY

Arthur Solomon VK3LJ
RMB E788, Millbrook, Vic. 3352

What if the information is lacking or incomplete? ? ?

There are many times when we want to construct single-layer air-core coils — for ATUs, tank coils, antenna traps, antenna loading coils, filters of various types, etc — and it is fine when the full details for the construction of those coils is at hand — and the recommended materials! But what if this information is lacking or incomplete?

The author decided recently to take an 80 metre dipole, add a loading coil and resonate it on 160 metres. Such an antenna had been built several years ago but the original notes were not available. A perusal of the *ARRL Antenna Handbook* located a graph from which information was gleaned that if the 160 metre dipole was cut to 50 percent of its length (equivalent to an 80 metre dipole), and a loading coil was placed in each leg at a point 80 percent of its length (ie approximately 52 feet) down from the dipole feedpoint, the loading coils would need to have an inductive reactance of 2500 ohms each. A few minutes with a calculator showed that, for a mid-band frequency of 1.830 MHz, a coil of 2500 ohms reactance would have an inductance of 217.42 microhenries.

So far so good; but where to from here? Several pieces of two inch diameter PVC were located which would serve well as coil formers. Some #18 enamelled wire was also found and from the Wire Tables in the *ARRL Handbook* it was discovered that close winding this wire would give 23.6 turns per inch. Now, this is where the "cut and try" approach begins. We are all familiar with the time-honoured formula:

$$L(\text{microhenries}) = (an)\wedge 2/9a + 10b$$

where a = radius in inches, b = length of coil in inches, and n = number of turns. So, what we usually do is try various figures for "n" until we get as close as possible to the required value for "L". To try to transpose this formula to get an expression for "n", I finished with not one unknown but two, because "b" is not known until "n" has been determined! Thus it takes considerable time and patience to arrive at a tolerable value for "n". There had to be a simpler way . . . and there was!

Firstly, let b=n/t, where t = number of turns per inch, which is easily found in wire tables for any gauge wire. Secondly, substitute back in the original formula and get the expression:

$$a\wedge 2xn\wedge 2 = 9aL + (10L/t)n$$

This, despite its apparent complexity, is a simple quadratic equation and easily solved by the Quadratic Formula, thus:

$$n = (10L/t +/- SQ.ROOT(100L\wedge 2/t\wedge 2 + 36L a\wedge 3))/2a\wedge 2$$

Lastly, transfer this equation into a computer program and the "game is sown up".

The accompanying *Coil Maker Program* will do all of the following:

1. It will calculate reactance, given the inductance of a coil and the frequency of operation.
2. It will calculate inductance, given the reactance and frequency.
3. It will calculate inductance, given the usual physical parameters of the coil.
4. It will calculate the number of turns, if it is told the required inductance, coil diameter and turns per inch (from the wire gauge).
5. It will tell, from the number of turns and the coil diameter, the exact length of wire required in both feet and metres.

Although the program is written for the 128 Microbee Premium disk system, it should not be difficult to adapt it to other computers. It would certainly be worth the effort of doing so as it will save a great deal of time in both the shack and workshop. It took less that two minutes on the computer to design the required loading coils, ie on a two inch diameter former I needed 110 turns (109.9) of #18 enamelled wire, with a coil length of 4.6 inches, and using 57.54 feet (17.54 metres) of wire.

```
00100 REM ***  THE COIL MAKER  ***
00110 REM  A programme to design air-cored coils for radio
00120 REM  purposes. It will calculate, given the necessary
00130 REM  parameters, the reactance, inductance,number of
00140 REM  turns and length of wire used in the making of
00150 REM  single-layer air-cored inductors.
00160 REM  #### Written by Arthur Solomon, Milburn,Vic.,1988 ###
00170 REM ############ T H E  C O I L - M A K E R  P R O G R A M M E  ############
00180 CLS
00190 PRINT" ###  C O I L - M A K E R  P R O G R A M M E  ###  "
00200 PRINT"================================================="
00210 CURS 1,3:PRINT"Select your requirement:"
00220 CURS 5,5:PRINT"1. Calculation of Inductance from the Reactance."
00230 CURS 5,7:PRINT"2. Calculation of Inductance from physical parameters "
00240 CURS 5,9:PRINT"3. Calculation of Reactance from the Inductance."
00250 CURS 5,11:PRINT"4. Calculation of Number of Turns."
00260 CURS 5,13:PRINT"5. Calculation of Length of Wire needed."
00270 CURS 5,15:PRINT"6. Exit from this programme."
00280 A0$=KEY:IFA0$=""THENGOTO280
00290 IFA0$="1"THENGOTO360
00300 IFA0$="2"THENGOTO490
00310 IFA0$="3"THENGOTO590
00320 IFA0$="4"THENGOTO680
00330 IFA0$="5"THENGOTO820
00340 IFA0$="6"THENEND
00350 GOTO280
00360 CLS
00370 PRINT"CALCULATION OF INDUCTANCE FROM THE REACTANCE:"
00380 PRINT"============================================="
```

```
00390 CURS 10,5:INPUT"What is the REACTANCE in ohms? ";R1
00400 CURS 10,7:INPUT"What is the FREQUENCY in MHz? ";F1
00410 U1=2*3.1416*F1:L2=R1/U1
00420 CURS 5,11:PRINT"The INDUCTANCE is ";[F10.2  L2];" microhenries."
00430 CURS 5,12:PRINT"-------------------------------------------------------"
00440 CURS 5,14:PRINT"Do you require further calculations?  (Y/N)    "
00450 A0$=KEY:IFA0$=""THENGOTO450
00460 IF(A0$="y")OR(A0$="Y")THENGOTO480
00470 IF(A0$="n")OR(A0$="N")THEN END
00480 GOTO180
00490 CLS:PRINT"CALCULATION OF INDUCTANCE FROM PHYSICAL PARANETERS:  "
00500 PRINT"=================================================":PRINT
00510 CURS 5,4:INPUT"What is diameter of coil in inches?          ";D1
00520 CURS 5,6:INPUT"What is the number of turns?          ";T1
00530 CURS 5,8:INPUT"Give the turns per inch of the winding.     ";P1
00540 A1=D1/2:X1=T1/P1
00550 L2=(A1*T1)^2/(9*A1+10*X1)
00560 PRINT:PRINTTAB(5);"The Inductance of your coil is ";[F10.2 L2];" Microhenr
ies."
00570 PRINTTAB(5);"-------------------------------------------------"
00580 GOTO 440
00590 CLS
00600 PRINT"CALCULATION OF REACTANCE:"
00610 PRINT"========================="
00620 CURS 10,5:INPUT"What is the INDUCTANCE  in microhenries?     ";L2
00630 CURS 10,7:INPUT"What is the FREQUENCY in MHz.?   ";F1
00640 X1=2*3.1416*F1*L2
00650 CURS 5,12:PRINT"The REACTANCE of the coil is ";[F10.2  X1];" ohms."
00660 CURS 5,13:PRINT"-----------------------------------------"
00670 GOTO440
00680 CLS
00690 PRINT"TO CALCULATE NUMBER OF TURNS TO OBTAIN GIVEN INDUCTANCE:"
00700 PRINT"=======================================================":PRINT
00710 CURS 10,4:INPUT"Required INDUCTANCE in microhenries?    ";L2
00720 CURS 10,6:INPUT"DIAMETER of former in inches?   ";DO
00730 CURS 10,8:INPUT"TURNS PER INCH of the winding?   ";T1
00740 D1=DO/2:B1=(10*L2)/T1:B2=(10*L2/T1)^2:C2=36*D1^3*L2:C3=2*D1^2
00750 R2=SQR(B2+C2)
00760 IFR2<B1THENGOTO790
00770 N1=(B1+R2)/C3
00780 GOTO800
00790 N1=(B1-R2)/C3
00800 CURS 5,11:PRINT"The NUMBER OF TURNS required is ";[F10.1  N1];"."
00810 GOTO440
00820 CLS
00830 PRINT"CALCULATION OF LENGTH OF WIRE NEEDED FOR THE COIL:"
00840 PRINT"=================================================="
00850 CURS 5,4:INPUT"Diameter of coil in inches?   ";D1
00860 CURS 5,6:INPUT"Number of turns?   ";T1
00870 CURS 5,8:INPUT"Turns per inch?    ";X1:B1=T1/X1
00880 L1=3.1416*D1*T1:L3=L1/12:L4=L3/3.28
00890 CURS 1,10:PRINT"COIL REQUIRES ";[F10.2  L3];" FEET OR ";[F9.2 L4];" METRES
 OF WIRE."
00900 CURS 4,13:PRINT"The length of the winding will be ";[F6.1 B1];" inches."
00910 CURS 4,11:PRINT"Note: add extra length to allow for wastage and inaccuracy
 of measurement."
00920 GOTO440
00930 END
```

NOT ANOTHER RD CONTEST PROGRAM!!!

Terry Neumann VK5ATN
PO Box 200, Balaklava, SA. 5461

Log-keeping is a tedious task.

Not another RD Contest Program! . . . Well! Yes and no. It is not a new program, but a plagiarised version of the C-64 program written by Dion Thomas and published in the July edition of *Amateur Radio*. In this version, specifically for the HF section of the contest, the program has been rewritten and enhanced for the TRS-80 Model IV computer. The Model IV, the last of the Tandy series of Z80 computers, is a fine computer in it's own right, but came just a little too late to follow up on the early success of it's predecessors and was trampled underfoot in the rush to the IBM PC and it's innumerable look-alikes, or alternatively to the Commodore 64, which has been embraced by many amateurs as the machine of the moment.

THE BACKGROUND

I have always enjoyed having a run in the RD contest. Not that there are ever any aspirations to win; but being the only contest in the calendar which I take at all seriously, I usually join in the fun on the HF bands for as long as is possible.

However, this enjoyment was seriously diminished by two factors. The first was the tedious, but essential, checks for duplicate contacts, either during the contest or in the weeks after. Secondly, since my writing is, to say the least, abysmal the entire log had always to be re-typed so the contest manager could actually read it. This often meant that the log was submitted right on the deadline, and sometimes was not submitted at all. I wonder how many other logs never reach the FCM for the same reason?

Consequently, I have always been on the lookout for a computer program which would take care of these two deterrents. When no less than four RD log programs were published in the July 1987 issue of AR, my interest was really aroused. Of these, the one written by Dion Thomas offered all of the features I most needed, especially the concept of writing contacts to disk immediately. (Our rural power supply is not as reliable as one could always hope for!). However, there were obviously some serious problems since the BASIC used by the C-64 series varies considerably in some areas from that used by the Tandy computers.

ADAPTING THE PROGRAM FOR THE TRS-80

Since my talents as a programmer were questionable at best, the task of re-writing and adapting Dion's program was tackled with some trepidation. A C-64 manual was borrowed from a neighbour, and work commenced. As it progressed, it became apparent that in some respects the task was easier than expected since the Tandy does not need constant opening and closing of the printer port in order to print a contact. Similarly, not having a colour monitor meant that much of the screen routines and commands could be simplified.

Finally a working version was ready for the 1987 contest. Whist the program worked well during the contest, it became apparent that several modifications and enhancements could be made to suit the features of the Model IV. A virtual rewrite of the program was undertaken to incorporate these changes. Special emphasis was given to saving space, since the Model IV has a somewhat limited free memory after BASIC is loaded. Accordingly REM statements have been kept to a minimum in the final version. The program as it presently exists has space for about 850 contacts, which will be adequate for all bit the top gun contesters given the present band conditions. If you are really serious about catching the top contesters, then you will probably need a program which offers more capacity than this one!

USING THE PROGRAM

My standard TRS-80 Model IV produces very little RFI so the unit was able to be operated next to the TS-43X without any real problems in this area. My TRS-80 also has the G Clock real-time clock installed. This is a very useful modification for any Model IV since the time is always accurate irrespective of disk identification and the machine knows the date and time whenever it is needed. The clock is set to UTC date and time before the contest. Accordingly, these details are not required in the program. Since the TRS-80 can also display the clock on the screen at all times, this facility was utilised. The < BREAK > key is also software disabled prior to the contest to prevent accidents.

The main operating menu for the RDLOG/BAS program is shown in Figure 1. Most of the features offered are similar to Dion's original C-64 version, but the layout has been altered to suit my own preferences. For the most part, I would expect that the operating features of both this and the original C-64 version would be similar.

In operation, the program works something like this:

1. On start-up, after previously setting the system date and clock for UTC, the user is prompted for band, and mode required, and whether the printer is to be selected. A previous check on other bands for each station worked is automatically enabled. This later feature is a useful one for what is, after all, the friendly contest, (Hello again, nice to meet you on this band as well. . .) but it does take a little extra time in execution of the program. If not required, it can be disabled from the main menu which then appears as shown in Figure 1.
2. When a call sign is entered, the computer checks for previous contacts from that station, listing (if required) previous contacts on other bands. If the station has already been worked on the band in use, a notice appears on the screen to that effect in inverse video, a tone is sounded, and the contact is cancelled. Pressing < ENTER > returns the screen to the main menu ready to try again.
3. If no previous contact has been made with the station on the band in use, the number to be sent is shown, and upon entry of the number received, the contact is immediately saved to disk with the correct time added. The contact will also be sent to the printer (if enabled) in the correct form for the FCM.
4. A contact can be cancelled at either of two points in the exchange, firstly by entering a minus < — > instead of the call sign of the other station, or by entering a minus instead of the number received. When this happens, the screen clears and again returns to the main menu.
5. Since some 90 percent or more of the stations worked in the RD will be from VK, the program assumes a VK prefix if a number is entered as the first part of a call sign. Therefore, my own call sign is entered as 5ATN. This save two keystrokes on each contact, (they all add up) and reduces the fumble factor. For ZL and P29 contacts (and VK if you wish) the full call sign, including the prefix, must be entered.
6. The functions of most of the command options on the main menu will be readily apparent. Pressing < F3 > forces a string clean-up "trash collection." The machine will sometimes do this of its own accord as the memory fills. This apparent 'hang-up' can take some time and is a nuisance if it happens during an exchange. The option of 'forcing' this to happen at a free time in the contest helps to overcome this problem.

SPECIAL POINTS

1. As with the original C-64 program, a new disk **must** be used for each contest. The data is always saved with the file-name *RDLOG/DAT* and chaos will result if an old disk with this file present is used for a new and different contest.
2. Testing with a friends standard TRS-80 Model IV without a G Clock installed revealed some worrying problems with accurate time keeping, even though recommended procedures in the manual (SYSTEM, SMOOTH=NO) were followed. It was found that the clock would still lose time during disk write operations, although it remained accurate otherwise. The loss was in the order of about 15-plus seconds in 10 minutes of continuous entries. It is not known whether this was a unique case, or an expected occur-

```
 RD CONTEST LOG - Version 4.02 - - -  Date is: 06/03/88   - -  TIME: 21:05:26
==========================================================================
 20297 Bytes free  - -    849 Contacts left.        Force G.C. - < SHIFT F3 >

Recall Disk Files - < ! >                          Print New Heading - < > >

Display Log - < Shift  F1 >                        Hard Copy - < Shift F2 >

To Change: -   Band - < F1 >                       Mode - < F2 >

Cancel contact  - < - >
--------------------------------------------------------------------------
Printer is  OFF                                    < & > for ON

Previous Band Check is  ON                         < $ > for OFF
--------------------------------------------------------------------------

Present Band is : 3.5   - - -    Mode : SSB    - - -     Next Number is:  2

Last contact: 1   2058 SSB 3.5 VK3ABP   3

Enter Callsign or Select function:
```

Figure 1: The Main Menu of the RDLOG program. The Time, Date, and last station worked are for demonstration purpoees.

rence with all 'standard' Model IVs. Whilst this order of error might be tolerated over a period of an hour, it is apparent that, unless a return to DOS is done at intervals, to reset the clock, the accuracy of the log over the duration of the entire contest would not be acceptable.

There are three possible solutions to the problem.

a) Obtain and install a G Clock.
b) Reset the clock at regular intervals (say every hour) as described above.
c) Dispense with all reference to the Model IV clock and change two lines in the program to accept a physical four digit input of the time at each contact. This is easily done and may well be the best solution if the problem is encountered. The changes needed will be included in notes supplied with the program listings.

3. TRSDOS 6.3 does not allow input of system date past 12/31/87 (or 31/12/87 in Australian). Therefore to use this version of the program (RDLOG402) you will need the new DOS LSDOS 6.3 which has vastly improved features in almost every area, and of course, allows dates up to the end of 1999 to be entered. If you have only TRSDOS 6.3 and have disabled the date prompt to be still able to use it, Version 4.03 of the program can be used. This version includes the original date entry routine as used by Dion in his C-64 program at the cost of some memory space. However, since the date will be re-entered when the log is later reprinted, there seems little point in being too meticulous about this detail for the contest itself. However, if perfection is your aim, use it by all means, but be sure to watch for the change in UTC date during the contest.

4. If it is necessary to close down the station at some point in the contest (after all most of us have to sleep sometimes), the computer can be shut down, and re-started by re-loading the log thus far saved to disk, and continuing on as before. The printer can also be shut down, but should **not** be physically disturbed, neither is a new heading needed on the next start-up. If this is done, the printout should continue without any interruption being obvious.

A WORD OF WARNING

Finally, and most importantly, operating a keyboard in the red haze and fury of a contest will probably be a new and confusing experience at first. For most people it is much easier to write whilst operating then it is to type. Proceed with caution, because mistakes are easy to make, and once the contact is finally entered, and is sent off to disk, it has gone and cannot be changed, for the present anyway. Keep a correction sheet at the ready in case any mistakes are detected, so that they can be altered later after the contest.

Being fully aware of my own inadequacies in this area, a second program was developed to allow the log to be reprinted in full at a later date from the disk file. Using the LDOS utility file editor (FED) mistakes can be corrected, or, if there is a real doubt about the correctness or validity of a contact, the points score can be reduced to zero for that contact.

In a following issue we will discuss this program.

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THE CAPACITIVELY LOADED DIPOLE ANTENNA
Some New Findings

Dick Turrin W2IMU
PO Box 65, Colts Neck, New Jersey, 07722, USA.

Some findings with thin wire dipole antennas.

THE CAPACITY LOADED wire dipole antenna has appeared in amateur radio literature for over 20 years, and in the professional literature for over 30 years (Refer 1, 2, 3, 4, 5, 6). Some of the claims include very wide band operation and high performance.

This article reports on some recent findings with thin wire dipole antennas of the design type introduced by W4FD, which received some notoriety and acceptance in the amateur radio fraternity [4]. The results presented here were generated by computer analysis using the *MININEC3* (Numerical Electromagnetic Code) program on an AT and T 6300 PC and is available from the WIA for the IBM XT/AT computer. The MININEC program originated at the Naval Postgraduate School in California, USA, and is admirably suited to analyse wire antennas of the type presented here.

THE CAPACITIVELY LOADED WIRE ANTENNA

The capacitively loaded dipole wire antenna which was analysed in this report consisted of 38 capacitors each 390 pF uniformly distributed at one metre intervals along a 40 metre long dipole of # 12 copper wire, as shown in Figure 1.

This particular antenna design results in a fundamental resonance at 7.0 MHz for a full wavelength long dipole. The simple empirical design criteria for this antenna, is that each capacitor series resonates with its adjacent "free-space" wire inductance at 7.0 MHz.

For a 40 metre long dipole, this design implies a stretching factor of two, at the design frequency. There is nothing unique about the choice of dipole length. In this case it was chosen as a convenient and practical length as well as a length used in one of the references [4].

The computer analysis was performed for "free-space" conditions and the generated results include:

1. The input impedance at the centred feed,
2. The current distribution along the dipole,
3. Far-field radiation characteristic patterns, and
4. Absolute gain in dBi (decibels above isotropic) in the direction of maximum radiation.

INPUT IMPEDANCE

The input impedance over a frequency range of three to 30 MHz is presented in Figure 2, in which the real and imaginary parts are graphed separately. Of particular interest is the behaviour around the fundamental resonance of 7 MHz but also the non-integer "harmonic" resonances of which there are three, at 12.6, 19.5, and 26.5 MHz.

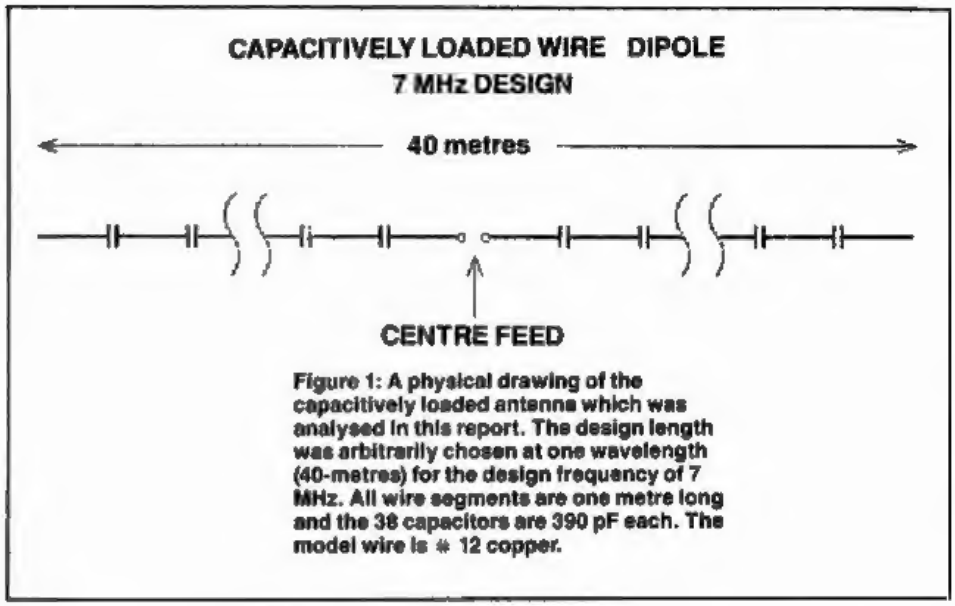

Figure 1: A physical drawing of the capacitively loaded antenna which was analysed in this report. The design length was arbitrarily chosen at one wavelength (40-metres) for the design frequency of 7 MHz. All wire segments are one metre long and the 38 capacitors are 390 pF each. The model wire is # 12 copper.

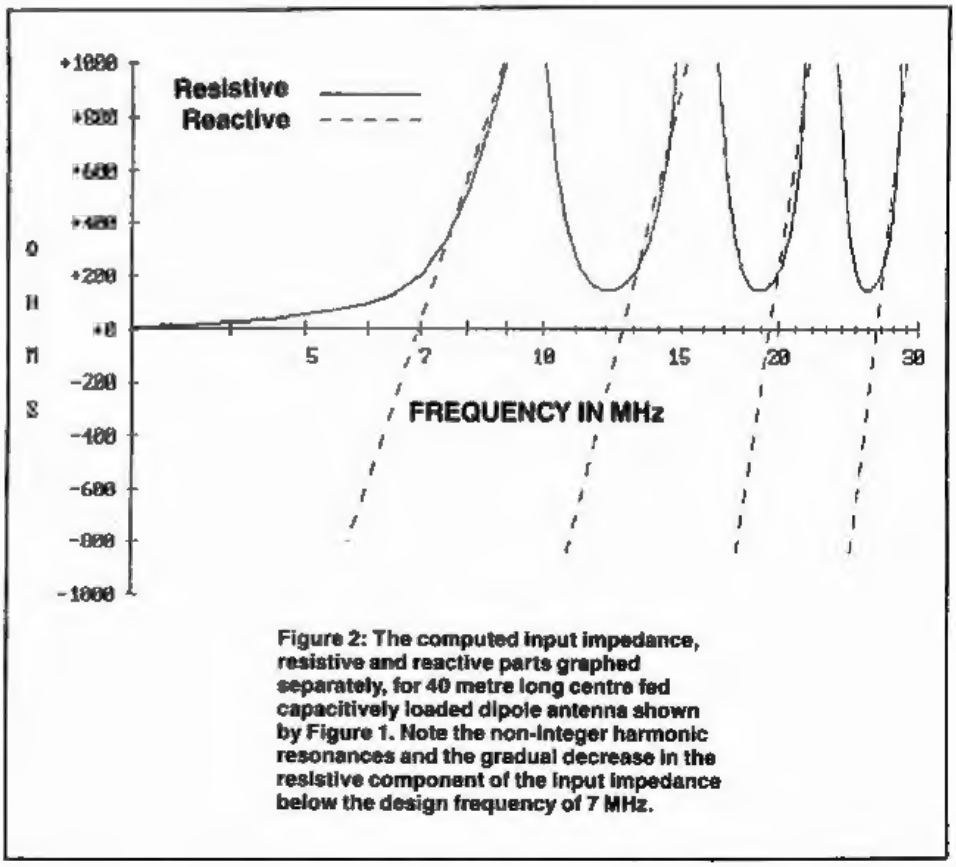

Figure 2: The computed input impedance, resistive and reactive parts graphed separately, for 40 metre long centre fed capacitively loaded dipole antenna shown by Figure 1. Note the non-integer harmonic resonances and the gradual decrease in the resistive component of the input impedance below the design frequency of 7 MHz.

An interesting features of this graph is that the fundamental resonance input impedance is 200 +j 0 and the higher resonances are between 150 and 160 ohms. Between these resonances the antenna nput impedance experiences stop-bands where the reactive component can be rather high.

This is not an ultra-broadband antenna, nor will it operate at integer harmonics without a suitable reactive tuner.

However, at the fundamental resonance of 7 MHz, the input VSWR computed for a 200 ohm feed system is a marked improvement compared with a simple halfwave wire dipole antenna. Figure 3 shows computed graphs of VSWR for both a wire dipole and the capacitively loaded wire dipole.

CURRENT DISTRIBUTION

The current distribution along this capacitively loaded wire antenna at the fundamental resonance was found to be very close to cosinusoidal, similar to a halfwave dipole, while at higher resonances it behaved very nearly like a centre fed long-wire antenna. This in contrast to some claims of a more uniform current distribution.

An intuitive understanding of wire antenna tells us that the current must fall to zero at the ends of the dipole radiator, but the current distribution along the rest of the wire is sometimes difficult to predict for a complex structure, such as the capacitively loaded thin wire dipole.

The MININEC3 computer program can approximate the current distribution with good accuracy by a complex process of dividing the wire into many short segments, and then calculating the uniform current in each small segment by including mutual couplings with all other wire segments. There were 40 segments used for this particular antenna analysis.

The current distribution is crucial to calculating the input impedance, and the radiation characteristics; which are also computed by MININEC3.

RADIATION AND GAIN

The radiation characteristics and absolute gain values are probably of more general interest since they are good indicators of how well the antenna will perform as a radiator of radio frequency (RF) energy. For "free-space" conditions, the characteristic radiation patterns of this antenna at its fundamental and three higher resonant frequencies are shown in Figure 4. To generate the full three-dimensional space radiation characteristics, simply rotate the pattern about the axis of the wire antenna.

While the 7.0 MHz pattern resembles a dipole radiation characteristic with a broadside radiation maximum, the higher resonance patterns are similar to centre-fed long-wire antenna radiation characteristics. This is as to be expected because the capacitive reactance decreases with increasing frequency, tending to short circuit the wire sections together into one continuous wire.

The absolute gain of this capacitively loaded wire antenna in the broadside direction and at 7 MHz, is +3.0 dBi (dB above isotropic) By comparison a standard halfwave dipole is +2.15 dBi This modest improvement in gain is due to the increased antenna length from a half wavelength to a full wavelength, and the spreading out of its current distribution

In contrast, the gain of the familiar double Zepp or two-halfwaves in-phase is +3.69 dBi. The capacitively loaded full wave dipole gain falls short of the double Zepp because the current distribution is concentrated at the centre

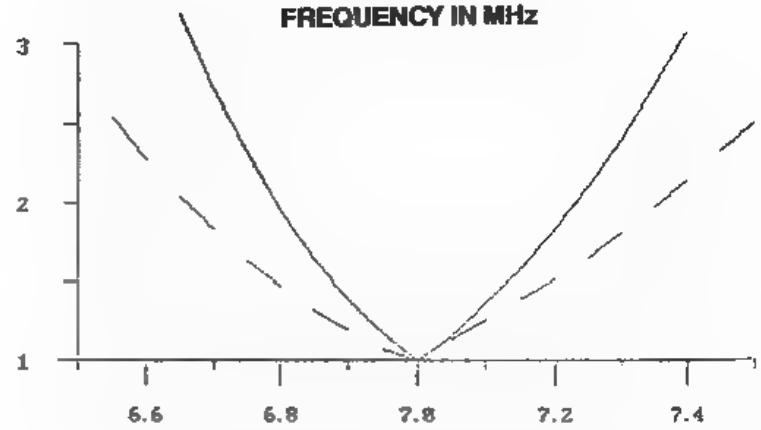

Figure 3: Computed Voltage Standing Wave Ratio for a halfwave dipole (solid curve) normalised to 72 ohms, and the capacitively loaded full wave dipole normalised to 200 ohms.

for the former and spread into separated crests for the latter. In addition, the capacitively loaded dipole does not have uniform phase along its length. Both antennas are the same physical length.

In antenna theory, maximum gain is always achieved when the current amplitude and phase distributions along the wire are uniform. A very improbable situation to achieve since the current must fall to zero at unconnected wire ends.

At the higher resonances this antenna exhibits gain in the direction of maximum radiation. At 12.6 MHz the gain is 3.45 dBi, at 19 5 MHz it is 4.81 dBi and at 26.5 MHz it is 5.56 dBi.

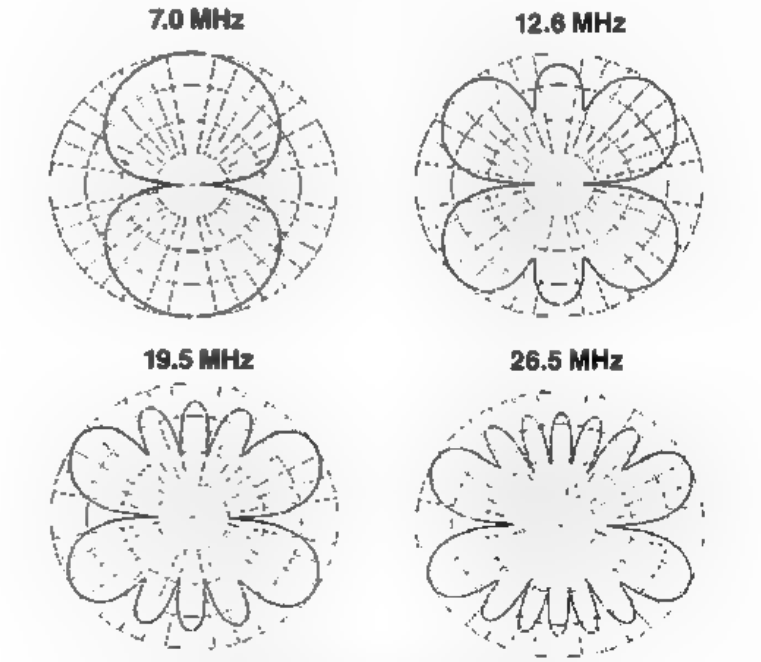

Figure 4: The computed "free-space" radiation characteristic patterns in the plane of the dipole. For the 40 metre long centre fed capacitively loaded antenna at its four resonant frequencies in the 3-30 MHz range, as indicated. Patterns are normalised to the maximum radiation level for each frequency. The radial scale is 0 to -40 dB.

REMARKS

The capacitively-loaded wavelength-long thin-wire dipole antenna shows a modest improvement in broadside gain over a conventional halfwave dipole by 0.84 dB. This cannot be regarded as a high-performance antenna nor can it be considered an ultra-broadband antenna. Although at fundamental resonance its bandwidth is better than a conventional wire halfwave dipole.

In the author's opinion, the physical size and difficulties of including capacitors along a wire antenna do not justify the predicted increase in performance.

An improvement in current distribution (more uniform) can be achieved using mixed, inductive and capacitive, loading. One such design, shown in Figure 5, employs four inductors and six capacitors on a full wavelength long dipole to achieve a broadside gain of 3.51 dBi. A unique feature of this particular design for 7 MHz is that the centre drive impedance is very close to 300 ohms resistive, making it convenient to feed with 300 ohm television ribbon feedline. The bandwidth of this antenna is only slightly broader than a halfwave dipole. Radiation is broadside, similar to the double Zepp antenna.

There are literally an infinite number of combinations of capacitive loading alone which may be analysed. However, it has been found, after an extensive search, that ultra-broadbanding cannot be achieved with only uniform or tapered capacitive loading of thin wire antennas.

Some early reports have achieved broadbanding in the UHF/SHF range employing capacitively loaded "fat" conductor antennas [2]. The conductor size requirement renders these designs rather impractical for HF application.

The purpose of this report has been twofold. First, to report some findings on the capacitively loaded dipole antenna which will aid prospective users and add to the knowledge of this type antenna.

And second, to make amateur radio antenna enthusiasts aware of the powerful MININEC program which permits a fairly straightforward and rapid analysis of complex wire antennas using readily available personal computers, a facility which, as little as 10 years ago, was virtually impossible.

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6. ATKINS, David, W6VX. *The High Performance Capacitively Loaded Dipole*, *Ham Radio*, May 1984, pp. 33-35.

Dick Turrin W2IMU, a retired Senior Engineer from Bell Telephone Laboratories, Horndel, New Jersey, is a world renowned expert in the antenna field. He has, in the past, been closely associated with the infamous Crawford Hill VHF Society through which he is remembered for the many years of technical notes he has presented through this Society.

His association with VK came to prominence when he had the first Australian EME QSO with Ray Naughton VK3ATN. This QSO was with K2MWA portable W2, later to be W2NFA (a 60 foot dish) which was operated by none other than Dick Turrin W2IMU.

Dick has been to Australia and presented a lecture to the Eastern and Mountain District Radio Club (EMDRC). He has, over the years, followed our magazine through Ray VK3ATN.

We are indebted that he has forwarded this article on capacitively loaded dipole antennas. The conclusions drawn will certainly interest all of those that may well re-think their views after reading this article.

—Doug McArthur VK3UM Technical Editor

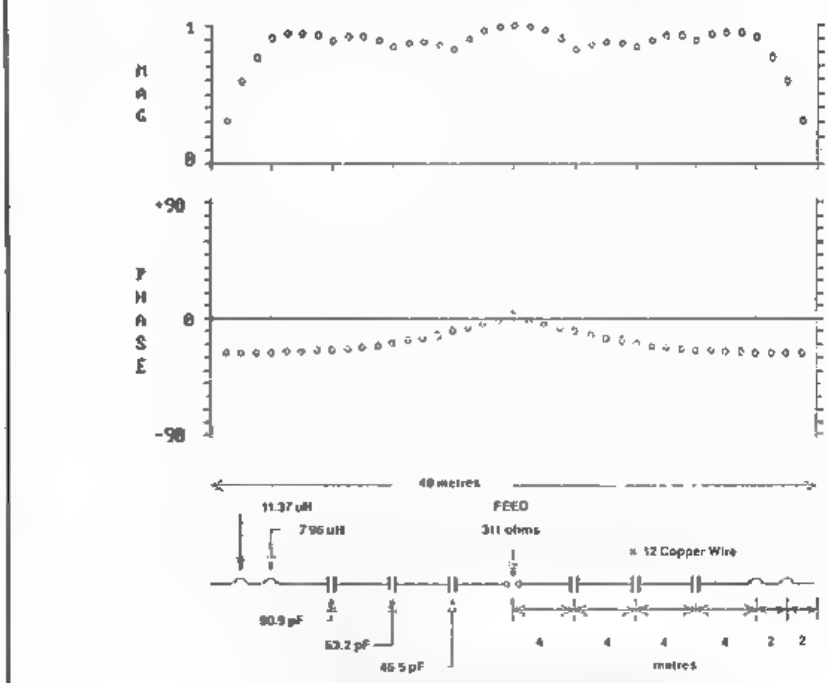


Figure 5: An antenna design employing mixed inductive and capacitive loading to achieve a nearly uniform current distribution along the wavelength long dipole antenna. Current distribution as computed by MININEC3 is shown along with design values for 7 MHz. The gain is 3.51 dBi and the radiation is broadside, similar to two-halfwaves in-phase.

A BOY AND HIS RADIO

The era of broadcasting had begun in Australia and it was up to a 12-year-old boy to demonstrate the wonders of wireless.

Don Reed VK4CDR, remembers the proud occasion adjusting the cat's whiskers on his crystal set as members of the Hornsby Council (NSW) looked on

His interest in wireless reception began while a student at the Hornsby Public School.

New equipment arrives on Christmas Island [illegible].

It was around 1924 when Morse code transmissions and then broadcasting from Farmer and Company, 2FC, and Broadcasters Ltd, 2BL Coogee had begun.

At the age of 18, prior to the start of World War II, he joined the No 1 Corps Signals of Carlow Street, North Sydney.

There he served under Major Rupert Sainsbury, who held amateur call sign OA2YJ. The Major taught Don how to build a transmitter using one 210A valve.

After being given an army call sign by the Major, he operated the transmitter on 45 metres from home to contact the army signals station

On one occasion a station with a strong signal using an army code queried Don by asking: "What station is that and where are you located?"

He replied in the secret code: "Official outstation of the Army Corps of Signs" Don passed his AOCP in 1931, while living at Waitara, New South Wales, and operated under VK2DR

Lured by the thrill of DX, his station gained the IARU Worked All Continents Certificate on June 25, 1936.

At the outbreak of war he tried to enlist only to be rejected because an Xray showed an unacceptable lung scar.

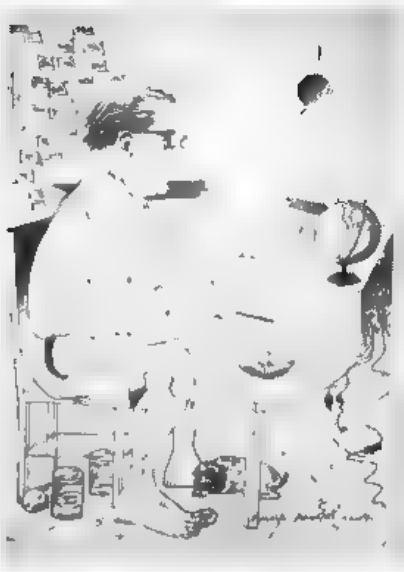
Don, who qualified for the First Class Commercial Operators Certificate, was then employed on the technical staff at 2GB, Sydney.

He also worked at 4LG Longreach, 4CA Cairns and 4TO Townsville. Later he was the Officer in Charge of Communications for 10 years on Christmas Island in the Indian Ocean from 1962

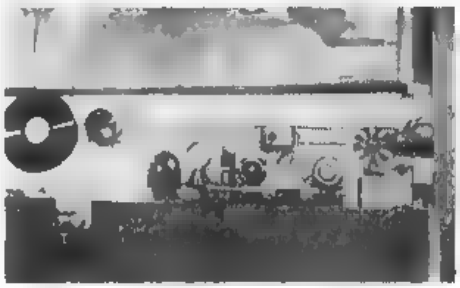
Don helped start the Christmas Island Amateur Radio Club, and himself signed VK9DR, from the island

After suffering a heart attack and returning to Australia to recover, Don took up a two-year posting with the Coastal Radio on Nauru in the Pacific, and was active as C21DR.

He encouraged local amateur radio activity on Nauru and neighbouring Ocean Island.



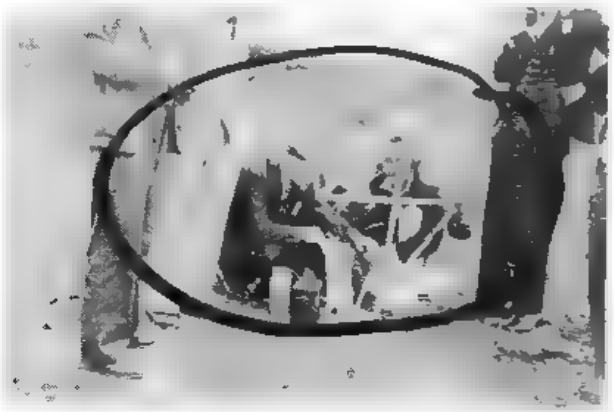
A caricature of Don on Christmas Island.



The station of VK2DR.

The next posting for 18 months was to Rabaul (PNG). Now in his 77th year, Don lives in retirement and keeps in contact with his many friends on air

The WIA Queensland Division bestowed Honorary Life Membership on Don Reed in recognition of his efforts in encouraging our hobby in the various places he was posted, and in particular, Christmas Island



Does any Old Timer recognise these amateurs? They were photographed at a Field Day at either Wyong or Gosford by Don VK4CDR.

TRY THIS! 1924-style "A Christmas Day Edition"

—Contributed by Bob Demkiw VK2ENU

THE DAILY TELEGRAPH, THURSDAY, DECEMBER 25, 1924

WIRELESS WORLD

JACKS

Three Valve Sets

HOW THEY ARE WORKED

The use of telephone plugs and jacks enables the number of valves in use to be changed in a simple manner.

The accompanying diagram shows the circuit of a three-valve set using three jacks, thus enabling either one, two, or three valves to be used as desired by simply pushing the telephone plug into the proper jack. The circuit without the jacks has been already described in a previous issue, so it is necessary only to consider the action of the jacks.

When it is desired to receive on one valve only the plug is pushed into the first jack (counting from the left), thus raising the upper blade of this jack from its contact with the lower blade, and connecting the 'phones in between the upper blade and the frame, and at the same time, breaking the circuit to the transformer.

The circuit from the plate of the first valve is then through the tickler coil to the upper blade of the jack, and 'phones to the frame of the jack, and then direct to the high tension battery, the transformer being cut out of the circuit automatically when the plug is inserted in the jack.

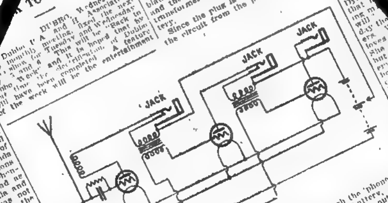
TWO VALVES.

If it is desired to use two valves, the plug is pulled out of the first jack, and inserted in the second jack. The upper blade of the first jack now makes contact with the lower blade, and the circuit from the plate of the first valve is through the tickler coil to the upper blade of the jack, to the lower blade, and then through the primary of the transformer to the high-tension battery.

Since the plug is in the second jack, the circuit from the plate of the second valve is through the 'phones direct to the high-tension battery, the second transformer being cut out because the plug has lifted the upper blade of the jack from its contact with the lower blade.

THREE VALVES.

When all three valves are required, the plug is inserted in the third jack, thus connecting the 'phones between the plate of the third valve and the high-tension battery. In each of the first and second jacks the two blades are making contact, and, hence, the transformers are connected in the plate circuits of the first two valves. It will be noticed that the third jack requires only one blade because it is not necessary to cut out any transformer from the plate circuit of this valve.



REPORT

News

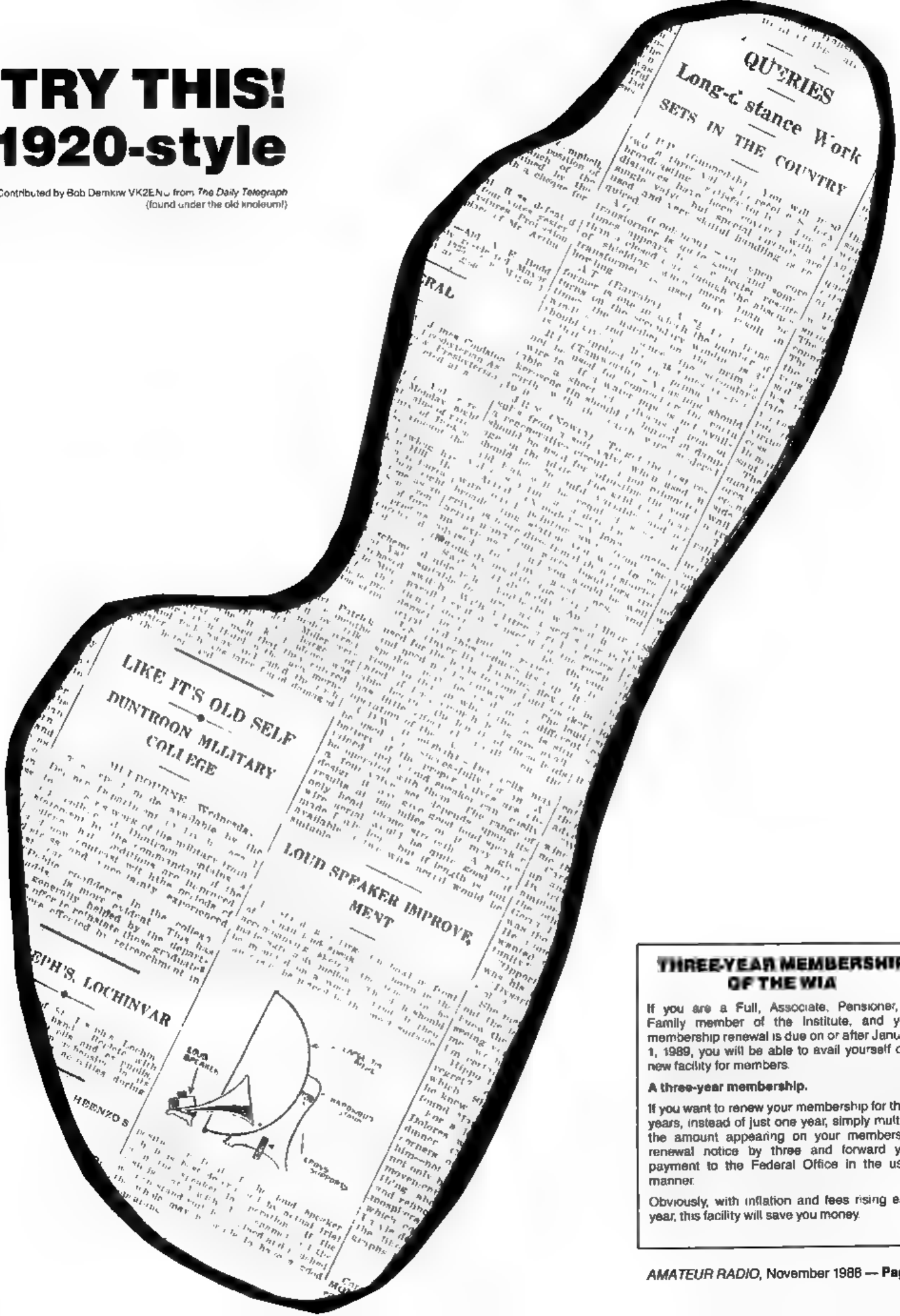
TO DUBBO

FOR THE DAIRYMEN.

FIRE AT DUBBO

TRY THIS!
1920-style

—Contributed by Bob Demkiw VK2ENC from *The Daily Telegraph*
(found under the old linoleum!)



THREE-YEAR MEMBERSHIP OF THE WIA

If you are a Full, Associate, Pensioner, or Family member of the Institute, and your membership renewal is due on or after January 1, 1989, you will be able to avail yourself of a new facility for members.

A three-year membership.

If you want to renew your membership for three years, instead of just one year, simply multiply the amount appearing on your membership renewal notice by three and forward your payment to the Federal Office in the usual manner.

Obviously, with inflation and fees rising each year, this facility will save you money.

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AN EXPERIMENTAL 'Q' METER

Lloyd Butler VK5BR
16 Ottawa Avenue, Panorama, SA. 5041

Q factor, the method of measuring Q factor and an experimental unit built up for that purpose.

For many years, the Q meter has been an essential piece of equipment for laboratories engaged in the testing of radio frequency circuits. In modern laboratories, the Q meter has been largely replaced by more exotic (and more expensive) impedance measuring devices and today, it is difficult to find a manufacturer who still makes a Q meter. For the radio amateur, the Q meter is still a very useful piece of test equipment and the writer has given some thought to how a simple Q meter could be made for the radio shack. For those who are unfamiliar with this type of instrument, a few introductory notes on the definition of Q and the measurement of Q, are included.

WHAT IS 'Q' AND HOW IS IT MEASURED?

The Q factor or quality factor of an inductance is commonly expressed as the ratio of its series reactance to its series resistance. We can also express the Q factor of a capacitance as the ration of its series reactance to its series resistance although capacitors are generally specified by the D or dissipation factor which is the reciprocal of Q.

A tuned circuit, at resonance, is considered to have a Q factor. In this case, Q is equal to the ratio of either the inductive reactance, or the capacitive reactance, to the total series loss resistance in the tuned circuit. The greater the loss resistance and the lower the Q, the greater the power lost on each cycle of oscillation in the tuned circuit and hence the greater the power needed to maintain oscillation.

$$Q = fo / \triangle f$$

where fo is the resonant frequency
and $\triangle f$ is the 3 dB bandwidth

Sometimes we talk of loaded Q (such as in transmitter tank circuits) and, in this case, resistance for calculation of Q is the unloaded tuned circuit series resistance plus the additional loss resistance reflected in series into the circuit from its coupled load.

There are other ways of expressing Q factor. It can be expressed approximately as the ratio of equivalent shunt resistance to either the inductive or the capacitive reactance. Series loss resistance can be converted to an equivalent shunt resistance using the following formula:

$$R(shunt) = R(series).(Q^2 + 1)$$

Finally, Q factor of a resonant circuit is equal to its voltage magnification factor and Q can also be expressed as the ratio of voltage developed across its reactive elements to the voltage injected in series with the circuit to produce the developed voltage. To measure Q factor, Q meters make use of this principle.

A basic Q meter is shown in Figure 1. Terminals are provided to connect the inductance (Lx) to be measured and this is resonated by a variable tuning capacitor (C). Terminals are also provided to add capacitance (Cx), if required. The tuned circuit is excited from a tunable signal source which develops voltage across a resistor in series with the tuned circuit. The resistor must have a resistance small compared to the loss resistance of the components to be measured so that its value can be ignored. A resistance of a mere fraction of an ohm is necessary. Metering is provided to measure the AC injection voltage across the series resistor and the AC output voltage across the terminals of the tuning capacitor. The output measurement must be a high input impedance circuit to prevent loading of the tuned circuit by the metering circuit.

Q is measured by adjusting the source frequency and/or the tuning capacitor for a peak in output voltage corresponding to resonance. Q factor is calculated as the ration of output voltage measured across the tuned circuit to that injected into it. In practice, the signal source level is generally set for a calibrate point on the meter which measures injected voltage and Q is directly read from calibration on the meter which measures output voltage.

SOME USES OF THE Q METER

The Q meter can be used for many purposes. As the name implies, it can measure Q and is generally used to check the Q factor of inductors. As the internal tuning capacitor has an air dielectric, its loss resistance is negligible compared to that of any inductor and hence the Q measured is that of the inductor.

The value of Q varies considerable with different types of inductors used over different ranges of frequency. Miniature commercial inductors, such as the Siemens B78108 types or the Lenox-Fugal Nanored types, made on ferrite cores and operated at frequencies up to 1 MHz, have typical Q factors in the region of 50 to 100. Air wound inductors with spaced turns, such as found in transmitter tank circuits and operating at frequencies above 10 MHz, can be expected to have Q factors of around 200 to 500. Some inductors have Q factors as low as five or 10 at some frequencies and such inductors are generally unsuitable for use in selective circuits or in sharp filters. The Q meter is very useful to check these out.

The tuning capacitor (C) of the Q meter has a calibrated dial marked in pico-farads so that, in conjunction with the calibration of the oscillator source, the value of inductance (Lx) can be derived. The tuned circuit is simply set to resonance by adjusting the frequency and/or the tuning capacitor for a peak in the output voltage meter and then calculating the inductance (Lx) from the usual formula.

$$Lx = 1/4\pi^2 f^2 C$$

For L in uH, C in pF and f in MHz this reduces to
$25330/f^2C$

Another use of the Q meter is to measure the value of small capacitors. Providing the capacitor to be tested is smaller than the tuning range of the internal tuning capacitor, the test sample can be easily measured. Firstly, the capacitor sample is resonated with a selected inductor by adjusting the source frequency and using the tuning capacitor set to a low value on its calibrated scale. The sample is then disconnected and using the same frequency as before, the tuning capacitor is reset to again obtain resonance. The difference in tuning capacitor calibration read for the two tests is equal to the capacitance of the sample. Larger values of capacitance can be read by changing frequency to obtain resonance on the second test and manipulating the resonance formula.

A poorly chosen inductor is not the only cause of low Q in a tuned circuit as some types of capacitor also have high loss resistance which lowers the Q. Small ceramic capacitors are often used in tuned circuits and many of these have high loss resistance, varying considerably in samples often taken from the same batch. If ceramic capacitors must be used where high Q is required, it is wise to select them for low loss resistance and the Q meter can be used for this purpose. To do this, an inductor having a high Q, of at least 200, is used to resonate the circuit, first with the tuning capacitor (C) on its own and then with individual test sample capacitors in parallel. A drastic loss in the value of Q, when the sample is added, soon shows up which capacitor should not be used.

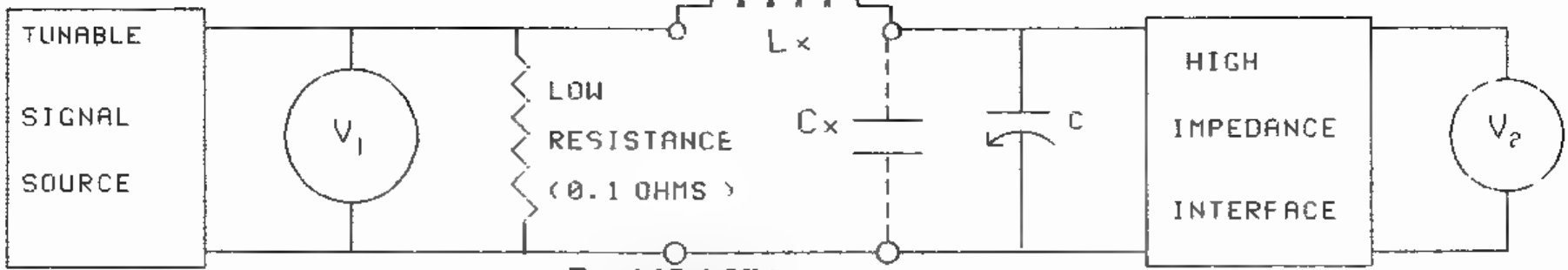


Figure 1: A Basic Q Meter.
At resonance of L_x and C, Q = V2/V1
*** Meter is calibrated to read voltage referred to that across C**

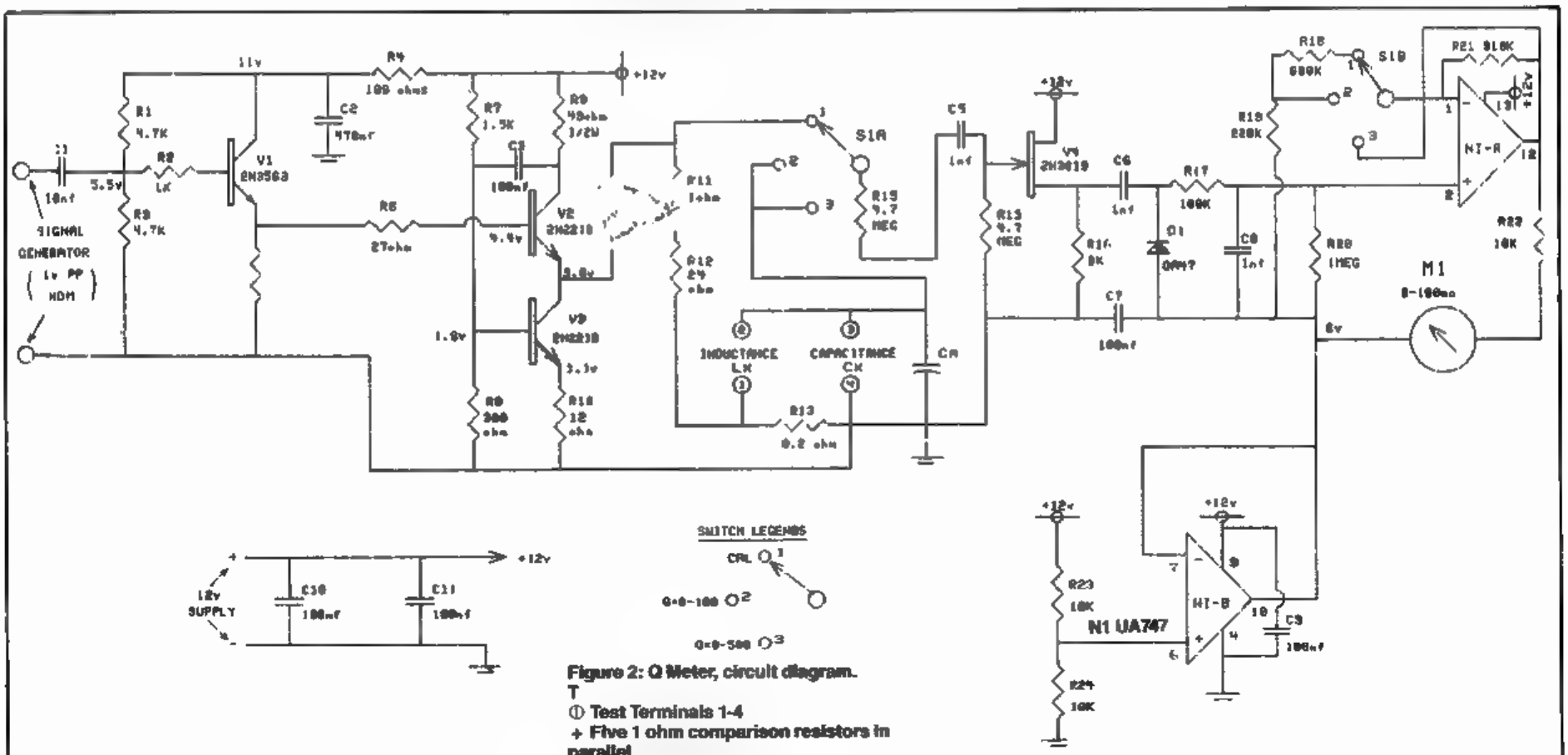


Figure 2: Q Meter, circuit diagram.
T
① Test Terminals 1-4
+ Five 1 ohm comparison resistors in parallel
*** Calibrate — set signal generator level for half scale on M1**

DISTRIBUTED COIL CAPACITANCE

Direct measurement of Q in an inductor, as discussed in previous paragraphs, is based on the circuit having two components, inductance and capacitance. Inductors also have distributed capacitance (Cd) and if this represents a significant portion of the total tuning capacitance, the Q value read will be lower than its actual value. High distributed capacitance is common in large value inductors having closely wound turns or having multiple layers.

Actual Q can be calculated from Qe, as read, from the following:

$$Q = Qe(1 + Cd/C)$$

where Cd = Distributed capacitance
and C = Tuning Capacitance

Q value error is reduced by resonating with a large value of tuning capacitance, otherwise distributed capacitance can be measured and applied to the previous formula. Two methods of measuring distributed capacitance are described in the *Boonton Q Meter Handbook*[1]. *The simplest of these is said to be accurate for distributed capacitance above 10 pF and this method is described as follows:*

1. With the tuning capacitor (Ca) set to value C1 (say 50 pF), resonate with the sample inductor by adjusting the signal source frequency.
2. Set the signal source to half the original frequency and re-resonate by adjusting Ca to a new value of capacitance C2
3. Calculate distributed capacitance as follows:

$$Cd = (C2 - 4C1)/3$$

Another effect of distributed capacitance in the inductor is to make its inductance value (as calculated from the calibration of the tuning capacitance and the calibration of the signal source) appear higher than its actual value. Again, this error can be reduced by tuning with a large value of capacitance Ca and/or adding Cd to Ca in the calculation.

THE EXPERIMENTAL UNIT

A little circuit design and experimentation have led to the Q meter circuit shown in Figure 2. A signal source is not included as it was thought that most experimenters would have some type of signal generator which could be used as a source. Addition of a signal source, normally internal in a commercial Q meter, would have added complexity which it was decided to avoid at the initial stage.

In designing a circuit, the biggest problem seemed to be how to develop an easily measured source voltage with a source resistance of a mere fraction of an ohm. An initial thought was to use a small multi-filar wound toroidal step down transformer from a higher resistance source. (In such a transformer, coefficient of coupling is high and leakage inductance is low). For this application, leakage inductance reflected in series with the secondary proved to be still too high and the idea was abandoned.

Another idea was to make use of the low source resistance of a power voltage follower stage to directly inject a signal into the tuned circuit. The follower circuit shown as V2-V3 in Figure 2 was used for this purpose. This type of circuit has wide bandwidth with very low source resistance and has been used before for such purposes as driving video signals into a low impedance transmission line. For the Q meter case, it was found necessary to operate the stage at the high collector current of 100 mA to achieve a sufficiently low source resistance. Because of this, transistors V2 and V3 ran with their TO5 cases quite hot. The circuit worked well at low frequencies but at higher frequencies, in the region of 10 to 30 MHz, the stage source resistance appeared to rise causing the Q values to read lower than expected.

The ultimate circuit, as shown in Figure 2, made use of the voltage follower stage but the stage was used to develop voltage across R13, a resistor of a fraction of an ohm as described in previous paragraphs. The value actually chosen is 0.2 ohm. Of course, the follower stage could not drive directly into such a low resistance and it feeds via resistors R11 and R12 (a sum of 25 ohms) so that the follower output voltage is 125 times that injected into the tuned circuit.

The power driver stage is preceded by an emitter follower stage (V1). This has high input resistance and hence the load resistance presented to the external signal source is essentially the parallel result of R1 and R3 (about 2300 ohms).

The test inductance (Lx) is connected across terminals 1 and 2 and external capacitance (Cx), if used, is connected across terminals 3 and 4. Tuning is provided by variable capacitor Ca, an ordinary receiver tuning gang with sections in parallel to provide about 800 pF maximum capacitance.

The high impedance volt-meter is provided by FET stage V4, connected as a source follower, peak reading detector (C6, D1, R17, C8, R20) and operational amplifier N1-A which drives a 100 microamp meter. The second operational amplifier N1-B in the uA747 package splits the rail voltage for N1-A.

Selector switch (S1) has three positions. The first position, labelled CAL, is used to set the signal input level which is adjusted for half scale reading on meter M1. (A signal level of around 1 VPP is needed at the input of V1). When the signal is set to the correct level, switch position 2 provides direct reading of Q = 0 to 100 on the meter and switch position 3 provides direct reading of Q = 0 to 500 on the meter. For low values of Q, the calibrate level at switch position 1 is increased to full scale on the meter so that switch position 2 reads Q = 0 to 50.

Signal levels into the AC volt-meter circuit are proportioned so that they are above the non-linear region caused by the diode characteristics, but within the limits of signal voltage swing set by the power supply rails. In switch position 1 (CAL) the amplifier N1-A has a voltage gain of 2, in switch position 2 it has a gain of 5 and in switch position 3 it has a gain of 1.

A rail potential of 12 volts was selected to power the unit but its precise value is not critical. The supply current is quite high, at around 100 mA, because of the current consumed by the V2-V3 transistor follower stage.

PERFORMANCE

Comparing Q readings with those measured on other instruments, the experimental unit appears sufficiently accurate to assess the performance of most inductors around the radio shack. For very high values of Q (around 400), with Ca set to minimum, the Q reads a trifle low. This occurs because of loss in resistor R14 connected in series with the input capacitance of V4. (The reading can be improved by eliminating R14, but without it, V4 is inclined to be unstable when Ca is bridged directly across its input). For a higher setting of capacitance Ca, the input capacitance of V4 is masked and the Q error is less noticeable.

Accuracy of inductance and capacitance measurement is set by the accuracy of the signal source and the accuracy of the tuning capacitor dial calibration. For anyone interested in building the Q meter, the calibration of the dial can be carried out by direct measurement of the tuning capacitor, at various dial settings, using a capacitance bridge or another Q meter. Another method is to make use of the signal source calibration in conjunction with an inductor of known accurate value. For various settings of the tuning capacitor dial, the signal source frequency is set for indicated resonance in the Q meter and the value of capacitance calculated. Assuming the inductor value and signal source frequency to be accurate, this is probably the best method as it takes into account added wiring capacitance and the active input capacitance of V4.

The unit was found to work quite well over the frequency range of 100 kHz to 40 MHz. Attempts to tune above 40 MHz gave erratic results but operation into the VHF range had never really been anticipated.

NOTES ON ASSEMBLY

The circuit shown in Figure 2 is simple and should not be too difficult to duplicate. All resistors in the RF sections of the circuit must be carbon types with low inductance. Resistor R13 (0.2 ohm) is made up of five one ohm resistors connected in parallel. The RF drive circuit (V1, V2, V3) is separated from the detector circuit (V4, D1, N1) by fitting on separate cards which are kept apart to reduce stray coupling between them. RF inter-wiring into the test terminals, capacitor Ca and switch bank S1a, is kept direct and short and must not be loomed. Resistor R13 is mounted directly on the test terminals. Terminal 4 is directly earthed to chassis and Ca is strapped to terminals 3 and 4 with a short length of tinned copper wire to minimise series inductance.

Transistors V2-V3 (type 2N2218) have a cut off frequency of 250 MHz and can dissipate 680 mW at 50 degrees Celsius. These could be substituted with other transistors of similar characteristics. Likewise, transistors V1 (2N3563) and V4 (FET — 2N3819) could be substituted with other small signal transistors having a high cut off frequency.

SUMMARY

A few ideas have been presented on how a simple Q meter can be built and how it can be put to use. Other applications of the Q meter can be found in manuals on early Q meters such as that prepared by the *Boonton Radio Corporation*[1].

References

1. *Manual of Radio Frequency Measurements for the Q Meter* Boonton Radio Corporation.

ar

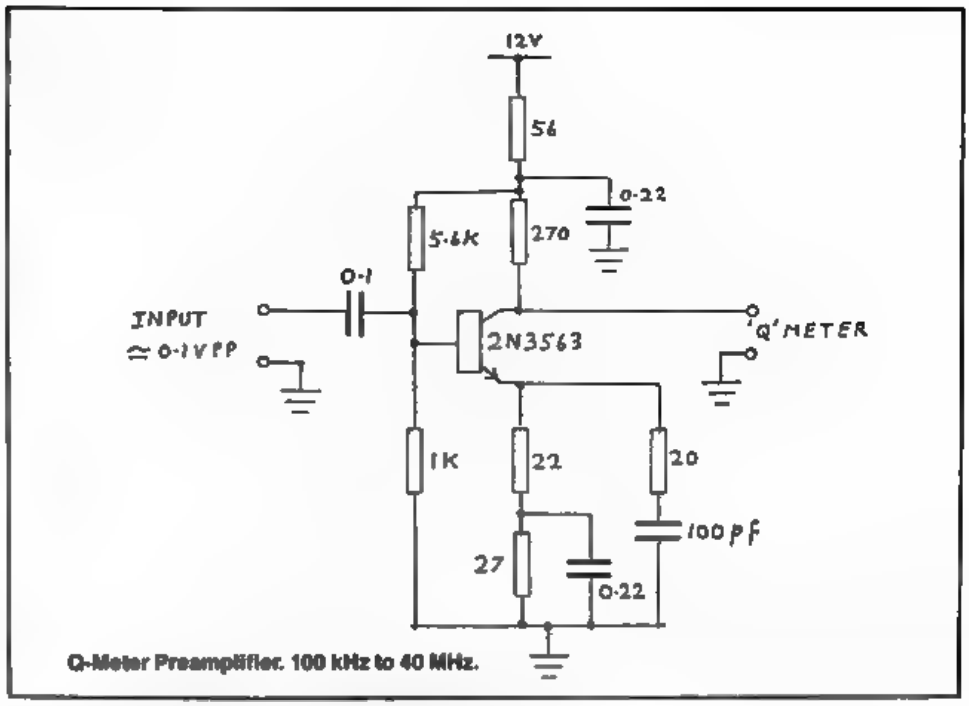
An Afterthought!

A SIGNAL SOURCE PREAMPLIFIER FOR THE VK5BR Q METER

The original experimental Q meter, required an external RF signal source of around one volt PP. Not all signal generators can deliver quite this level of output voltage and, for use with these generators, some preamplification is needed at the Q meter signal input.

The wideband amplifier shown in the diagram provides a gain of approximately 10 over the operating range of the Q meter of 100 kHz to 40 MHz. Connected at the input of the Q meter, it changes the input sensitivity to about 0.1 VPP to make the Q meter usable with a greater variety of RF signal sources. No gain control is provided as signal generators normally have an adjustable attenuator to set the output level.

For those who might be considering duplicating the Q meter, the preamplifier is a useful addition to make it operate in conjunction with lower level signal generators.



Q-Meter Preamplifier. 100 kHz to 40 MHz.

THE INTERNATIONAL AMATEUR RADIO NETWORK

Sam Voron VK2BVS
IARN AUSTRALIAN DIRECTOR
2 Griffith Avenue, Roseville, NSW. 2069

The IARN provides world-wide emergency communications during disasters through 750 radio amateurs in a network maintained by regional directors.

It started at the time of the Mexico City earthquake disaster of 1985, and had since spread internationally.

The IARN airlifted a number of radio amateurs into Mexico from the USA and their role in providing emergency communications was very effective.

The regional directors form the IARN emergency communications activation plan which can, by a phone call, harness the resources of amateur radio into focus on any international communications requirement.

The directors are Sam VK2BVS (Australia), John ZL2ARF (New Zealand), Les G4BCP (United Kingdom), Moshe 4X4MG (Israel), Maggie YS1ZA (El Salvador), Rob VE7AGO (Canada), Charles 9H1FBS (Malta), Ruben HC1RF (Equador), and Tetsuji JA1EQZ (Japan).

The USA Regional Manager is Glenn K1MAN, local in Belgrade Lakes, Maine, who is also the IARN General Manager

The IARN directors monitor two HF frequencies — 14.275 MHz and 7.228 MHz — which are used to handle Third Party Traffic health and welfare messages during a disaster activation.

During normal times the IARN provides humanitarian help through various projects.

These have included the airlifting of babies requiring urgent heart surgery from El Salvador for medical attention in the USA.

Another aspect of the IARN is five daily 45 minute information bulletins. These contain news about developments in amateur radio, disaster preparedness information, interviews and editorial comment.

Bulletins are anchored by Glenn Baxter K1MAN. They are broadcast on 3.975, 14.275 and 28.475 MHz at 1400, 1800, 2200, 0100 and 0500 UTC. Plus Sundays on 3.890 MHz (AM) at 2300 UTC and 7.290 MHz (AM) at 2400 UTC. Between April and September, times are one hour earlier.

PACIFIC E(MERGENCY) NET

In Australia, radio amateurs have a proud history of helping its community in times of international disasters.

They received third party traffic handling privileges in August 1980. The following year, during the national telephone breakdown, radio amateurs handled health and welfare [redacted] for those in desperate personal need to contact friends and relatives.

The first international involvement was the Mexico City earthquake (1985). Then came another earthquake in El Salvador (1986), the cyclones of Vanuatu (1987) and New Zealand (1988) and the Edmonton Canada tornado (1987).

The Japanese E(MERGENCY) NET comprises 200 radio amateurs dedicated to the public service aspects of their hobby.

To develop an emergency amateur radio communications capability in the Western Pacific, Asia and Australia — the Japan E Net and the Australian Traffic Net have combined to form the Pacific E Net.

This net introduces radio amateurs in the region to emergency preparedness planning by operating at 0001 and 0600 UTC on 21 160 MHz (± 15 kHz) and 1130 UTC on 7.090 MHz (± 10 kHz).

This time schedule is used whenever a disaster hits the region. One capability Australian radio amateurs have developed for the Pacific E Net is phone patch.

In a disaster, an operator in any of the wide variety of foreign language countries could be patched via Australian phone patch to pass detailed emergency traffic to translators who are readily available.

VK2 DISASTER TRAFFIC NETWORK

A club station of the IARN is VK2DTN, in Sydney, which has been set up to assist those studying for their amateur radio licence and provide training in international disaster public service.

The station has been fitted with two operator positions dedicated for national communications on 80 and 40 metres, international contacts on 40/20/15 metres, two metres FM and 11 metres CB for local communications.

An IBM compatible XT computer completes the line-up for linking into Bulletin Board Service telephone systems.

Inquiries about the club station and the training available through the IARN, can be directed to the author of this article. Sam Voron, on telephone (02) 407 1066.

RF IMPEDANCE MATCHING USING FERRITE TOROIDAL CORES

Part 3: CONVENTIONAL TRANSFORMERS

Stephen Bushell VK3HK
74 King Parade, Knoxfield, Vic. 3180

In parts 1 and 2 we realised the benefits and limitations of using transmission line transformers and auto-transformers. The main restriction was the inability to provide a universal current balance format with any required transformation ratio. To meet this requirement it is necessary to have separate primary and secondary windings on our transformer.

3. CONVENTIONAL TRANSFORMERS

A conventional transformer consists of two separate lengths of wire which are electrically insulated from each other and which form the primary and secondary circuits. When an alternating current is applied to the primary winding, a voltage will be induced in the secondary winding. The intensity of the voltage which is thus induced depends upon the ratio of turns between the windings.

The degree of magnetic coupling between the windings is determined by their proximity to one another and by the permeability of the core about which they are wound. The permeability is, in turn, affected by the degree of current flow and consequent flux density existing in the core. A point will be reached where the core will not pass any greater power. The core is then said to be saturated.

Because of the mode of current transfer just described, the size of the ferrite core when used in a conventional transformer must be larger than for the equivalent current flow in either a transmission line transformer or an auto-transformer.

When a load is connected to the secondary winding, power will be drawn by the primary winding from its current source sufficient to provide for the secondary circuit consumption and any other losses associated with the transformer itself. The impedance of the primary winding is therefore almost exclusively determined by the load connected to the secondary winding and by the turns ratio.

The following formula may be used to determine the primary winding impedance (Z):

$Z = Zs\ (Np/Ns)^2$

Where:

Z = Primary impedance
Zs = Secondary impedance
Np = Primary turns
Ns = Secondary turns

From the above we can derive the following:

$Np/Ns = \sqrt{Zp/Zs}$

Where:

Np/Ns = Primary:secondary turns ratio
Zp = Primary impedance
Zs = Secondary impedance

If we have a primary impedance requirement of 75 ohms and a secondary impedance of 300 ohms then:

$Np/Ns = \sqrt{Zp/Zs}$
$\therefore Np/Ns = \sqrt{75/300}$
$\therefore Np/Ns = \sqrt{.25}$
$\therefore Np/Ns = .5$

The primary coil must have half as many turns as the secondary.

Such a transformer is very easily constructed on a toroidal form by using a single trifilar winding which is spread to occupy at least ⅓ of the core circumference. (See Figure 1.).

Each winding may be identified although I always leave the primary unmarked. The other two are marked according to ones preference. These two secondary windings are then joined bottom to top to provide a series winding which has twice the number of primary turns.

The most important requirement we wished to cover with conventional transformers was current balance format. This is arranged for very easily by simply grounding one side of the winding according to which side of the transformer — primary or secondary, is required to be unbalanced. (See Figure 2.)

Various methods may be employed in constructing the conventional transformer when using ferrite toroidal cores. One method already described used a single multifilar windings applied to the same core. (See Figure 3.).

Yet another, probably the most conventional method of winding is to simply apply the primary winding to occupy at least ⅓ of the core body and to then wind the secondary over the primary to occupy the same amount of core.

So far we have seen that we can transform most impedance ratios with any current balance by using one of our three transformer families.

Next time we will look at assembly ideas, methods and circuit configurations.

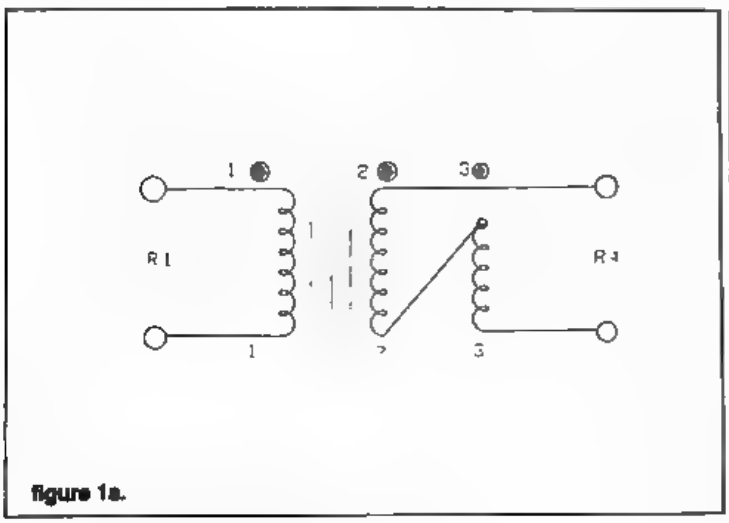


figure 1a.

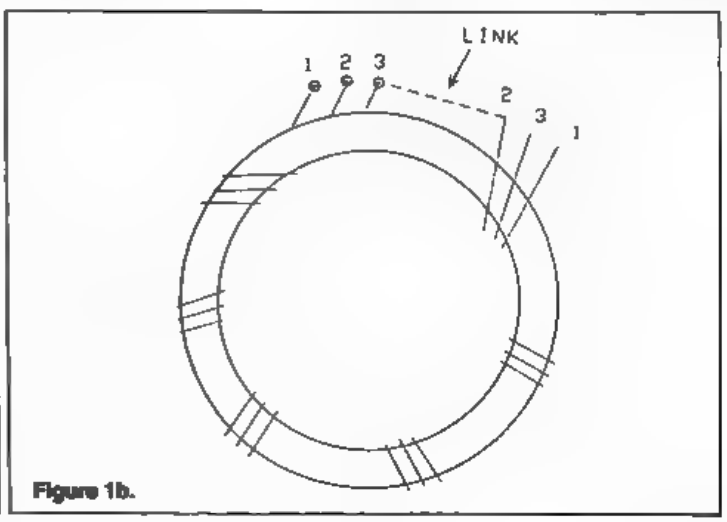


Figure 1b.

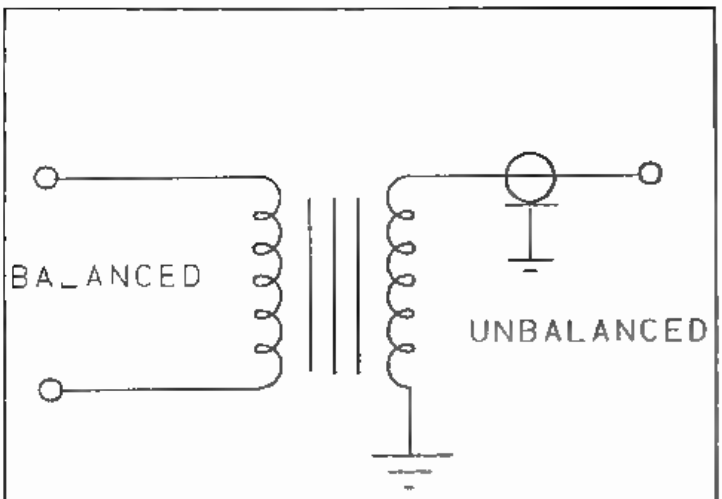


Figure 2a.

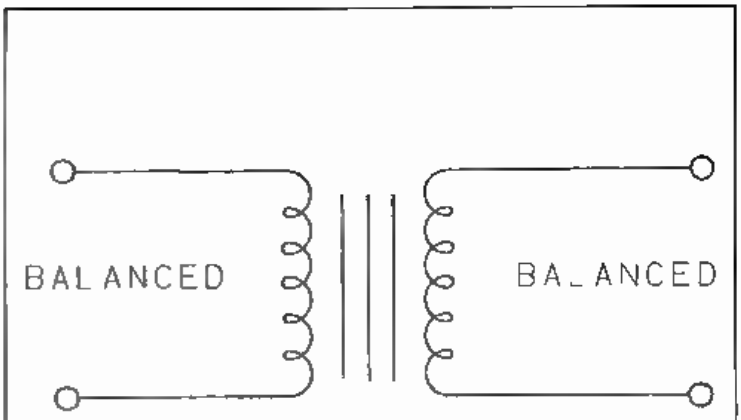


Figure 2b.

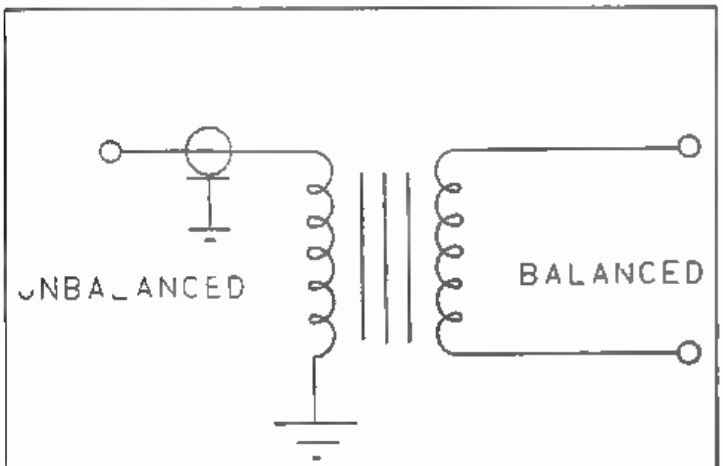


Figure 2c.

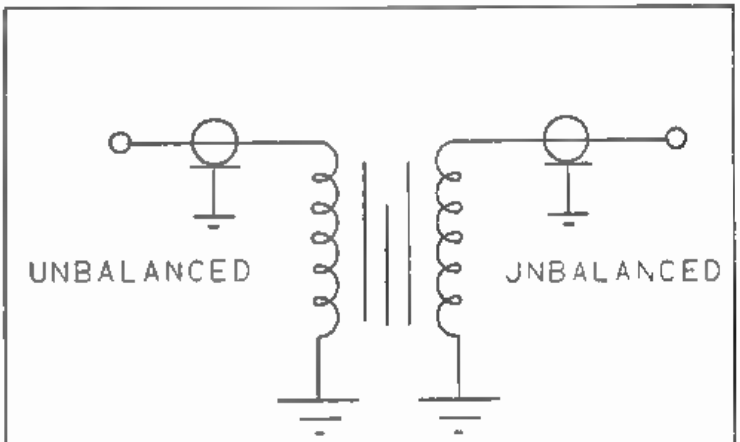


Figure 2d.

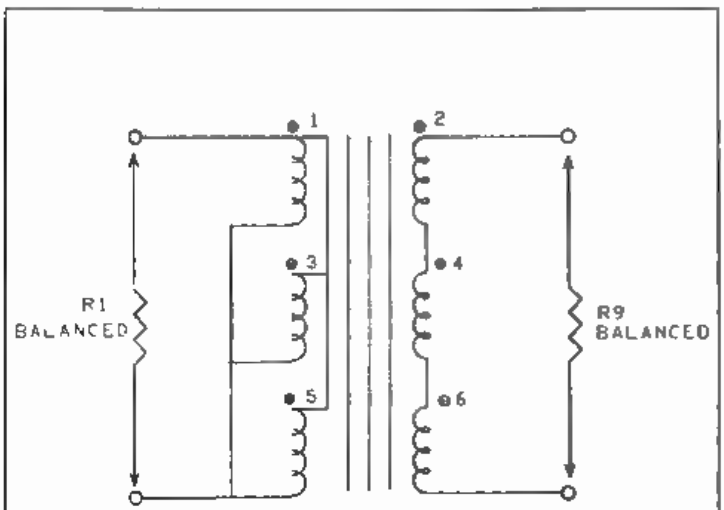


Figure 3a.

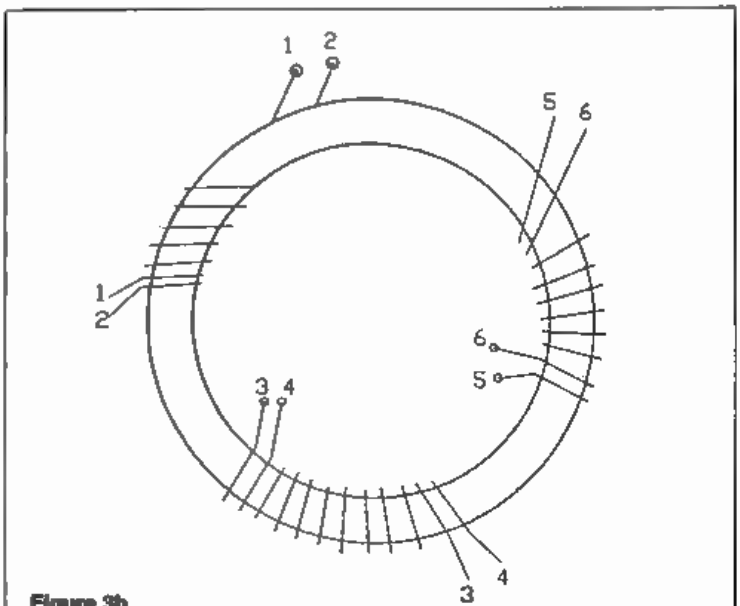
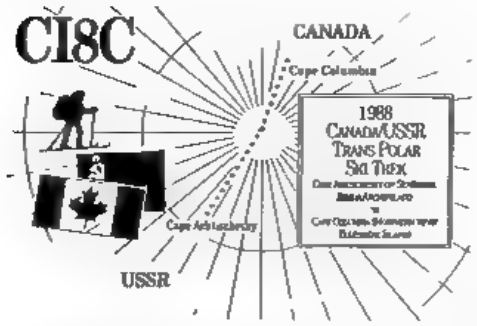


Figure 3b.

SKITREK



Three months across the ice with amateur radio — a success.

David Adams VE3HBF
RR1, Sutton West, ON. L0E 1R0

Printed with permission from QST CANADA, September issue, the Official Journal of the Canadian Radio Relay League Inc

This year, 13 skiers made polar history by skiing without motorised transport, dogs or sleds from the Soviet Union to Canada by way of the North Pole, a distance of some 1750 kilometres. The four Canadian and nine Soviet skiers reached Ward Hunt Island at 1035 on the morning of June 1, 90 days after setting out from Cape Arktichesky in the Severnaya Zemla Archipelago on March 3. They stepped ashore in line abreast so that no one could claim to be first, symbolising the teamwork and co-operation that made this unique event successful.

This splendid feat, the Polar Bridge Skitrek Expedition, was supported by an amateur radio communications network that also made history. Never before had this kind of international expedition relied solely on amateur radio for all its communications needs.

Co-ordinators of the amateur radio effort were Tom Atkins VE3CDM, President of the Canadian Radio Relay League, and Leonid Labutin UA3CR, a veteran of several previous Soviet polar expeditions. Leonid approached Tom in March 1987, asking for the support of Canadian amateurs. The basis for co-operation would be a unique reciprocal operating and third party traffic agreement between the two countries, the first such agreement ever for the USSR, allowing Soviet and Canadian amateurs to operate from each other's countries and to handle messages between them, without restrictions, through base stations in the Arctic.

Chief operator, Barry Garratt VE3CDX, recruited the team of Canadian operators that would man the Canadian base station at Resolute Bay, CI8C. Both Tom VE3CDM and Barry went to Moscow to make final arrangements with Leonid and the Soviet amateurs. While visiting UK3KP, the club station of *Komsomolskaya Pravda* (a Soviet youth newspaper), Tom and Barry became the first Canadian amateurs to operate from the USSR under the newly signed reciprocal agreement. Soon after, Rick Bourke VO1SA joined Leonid at EX0CR, the main Soviet base station at Sredniy Island, some 200 kilometres south of Cape Artichesky, the point from which the skiers started their trek. Rick's own call, VO1SA/UA0, was often heard S9 by scores of Canadians and others monitoring further to the south, as he passed traffic to Resolute Bay, Toronto and Ottawa.

In Ottawa, Ron Bellville VE3AUM, was the expedition's tireless anchorman, passing messages to and from Expedition Manager, Peter Baird and between the skiers and their families, and dealing with the government and media. In Toronto, it was Tom VE3CDM, who was besieged with phone calls and visits from the media as he effectively dealt with problems of logistics, movement of equipment and operators, and a score of other matters as new situations arose.

Icom supplied a full range of equipment: HF and VHF transceivers and amplifiers for the base stations, two metre FM hand-held transceivers and a VHF AM transceiver that would permit communication with the aircraft bringing supplies for the skiers. The base station equipment, in the hands of Barry VE3CDX, and his team of experienced operators, provided contacts between the skiers (known as the "moving group"), and their families, their support groups and suppliers, and the world-wide amateur radio community. Never before did an expedition like this have communications that functioned so smoothly around the clock, or did more to keep up the morale of its participants through every kind of hardship. Much credit must go to the Soviet operators, most of whom had worked together for many years in the remote harsh climate of the polar regions, and to the Canadians whose experience and teamwork resulted in plaudits from radio amateurs around the world.

Besides the Icom equipment the moving group carried a Soviet-designed miniature transceiver operating on crystal-controlled frequencies in the 20, 40 and 80 metre bands, and a dipole antenna that could be raised on a mast made of 34 ski poles connected end to end. All of this was developed over years of Arctic travel and experimentation.

Garth Hamilton VE3HO, who operated CI8C during the critical first two weeks of the expedition, later became the principal backup for Tom VE3CDM. Garth maintained a constant watch on expedition frequencies and forwarded messages and technical advice. Olle Ekblom SM0KV, and his Swedish colleagues also maintained a daily watch throughout the Skitrek, recorded daily satellite position reports, checked in daily with CI8C, and kept an eye on Soviet radio and television reports. Active support also came from AMSAT, through President Vern Riportella WA2LQQ, Richard Ensign N8IWJ, and AMSAT Director John Henry VE2VQ.

Once the skiers approached the North Pole, "mission control" shifted from Sredniy Island to the base station at Soviet Ice Island NP28, then located only 20-30 kilometres from the pole. Here Barry VE3CDX, joined Piotr, operator of 4K0DC, and used his personal Soviet call sign, 4K0DX, for a month of intensive traffic handling.

On April 26, when the skiers arrived at the North Pole, they were greeted by a gathering of almost 200 Soviet and Canadian officials and media people. Barry was up to his ears in official and unofficial duties and was delighted when Mike G0/PA0BHF, the UoSAT technician from the University of Surrey, UK, offered to assist by operating CI8UA and giving scores of amateurs their first ever QSO with the North Pole. Mike had been flown in with the Soviet group, in recognition of his key role in operating the UoSAT OSCAR II digitalker that gave the skiers their daily position reports.

Now, CI8C at Resolute Bay became the communication hub. Just before Barry VE3CDX left for Resolute, he had a chance to experience a danger that the Soviet team on NP29 faced daily. The ice island split apart, breaking the runway for supply aircraft in two and sending Barry's camera, some supplies and some valuable Icom equipment to the bottom of the Arctic Ocean.

Media coverage of the Skitrek expedition was considerable. The job of keeping everyone informed was handled by Al d'Eon VE3AND. Al issued regular news releases and made direct contact with key media people. Interviews with an amateur radio flavour appeared on *The Journal*, *Midday* and other television programs across the country. Newspapers carried feature articles and radio stations carried frequent reports. Amateur radio publications around the world, gave prominent coverage to what was clearly recognised as a major milestone in amateur radio communications.

Throughout Skitrek, Tony Fegan VE3QF, provided the amateur radio community with OSCAR II orbital data and advice for would-be monitors. Any radio amateur with a two metre hand-held could hear the digitalker on board OSCAR II by listening at appropriate times on 145.825 MHz. Many amateurs who were teachers made a strong effort to involve their students in monitoring and charting the progress of the skiers across the Arctic. The Ontario Science Centre in Toronto (an education facility where, for students of any age, science becomes fun) mounted a display that included a large map, recordings of the digitalker and a special on-the-air message from CI8C.

Following the completion of the expedition, both the Government of Canada and the Soviet ambassador in Ottawa gave official receptions.

Questioned in Ottawa about "What next?", the expedition's leader Dmitri Shparo UA3AJH, hinted at the possibility of an Antarctic expedition. Now that the USSR-Canadian Skitrek had laid the foundation for closer co-operation between these two countries, it might be possible for the USSR to achieve something similar with the United States. Hopes were also expressed that members of the Canadian communications team might visit Moscow in the near future.

Operation Update

Ken McLachlan VK3AH
PO Box 39, Mooroolbark, Vic, 3138

New portable radios currently being issued to Victoria's police would mean a significant improvement in the Force's present vast and sophisticated network according to discussions with senior police, recently.

Chief Superintendent Peter Graham, the Officer in Charge of the Communications District, stated that the radios were the most advanced and efficient in police use anywhere in Australia. Mr Graham stated that it was the aim of the Victoria Police to develop a portable radio network which would 'keep all operational police in the metropolitan area in touch at all times'.

Within two years there would be two portable radios in every city and suburban patrol car, and the radios would be carried by all foot patrol police.

The number of portable radios in the Force has already been doubled with the purchase of 535 of the new Motorola *Saber III* radios, at a cost of over one million dollars and it is envisaged that another thousand radios which represent the latest portable radio technology, will be purchased as part of a six million dollars communications package over the next three years.

Chief Superintendent Graham stated that these units ' are smaller, more flexible, more reliable and more durable than anything we've had before — and they're cheaper than the radios currently in use.

"They have the capacity to handle up to 200 channels, which means they can be used on the same frequencies as organisations like the State Emergency Service and the Alpine Resorts Commission if we are working together on operations such as searches," he said.

Photographs courtesy of Bottsen Productions

Senior-Constable Kaylene Fraser

These miniature technological wonders are a world-wide winner. They have a sensitivity of nominally 0.3 uV across the frequency spectrum ranges of 146-172, 403-420 and 450-512 MHz with a transmitting output of two watts, nevertheless Motorola does manufacture a larger five watt unit. The removable power source is Nicad batteries which are charged in either a one-hour rapid rate state or the more preferred and conventional longer period from the AC mains. Provision for charging from the vehicle is another attribute which will be provided in the future.

Strict quality control is a feature that allowed Motorola to gain the contract from other manufacturers and a stringent accelerated testing period taking into account the type of work that the unit was designed to endure such as humidity, extreme temperature variances, precipitation environments and still maintain a simple unit to be used by all personnel with a minimal amount of training. These units, it is felt, surpassed their designers dreams after enduring this 'speed' testing.

Chief Superintendent Graham said recent major incidents such as outside Police Headquarters, also the disastrous shooting incidents within the city and its environs, involving the loss of lives and massive injuries to innocent people, emphasised the need for more police portable .

"It's vital for operational police to be able to remain in touch with D24' and each other when they have to leave their vehicles in situations such as that.

Chief Superintendent Peter Graham, who will be responsible for the commissioning of the SABER III transceivers.

"The expansion of our portable radio network, and the consequent improvement in communications, is good news not only for police but the community. Improved police communications means more effective and efficient use of police resources, and that means improved service to the public," he said.

The personnel who recommended the use of such a method of direct communications as those that evaluated the units, are to be congratulated on their forethought and choice which will upgrade all operational officers in their unenviable task of continual community protection.

Sergeant Dennis Johnson.

Further information on this and other Motorola products may be obtained from Mr Tim Herring, Marketing Manager, Motorola Communications Australasia, 666 Wellington Road, Mulgrave, Victoria, 3170. Mr Herring has greatly assisted in the preparation of this article. Sincere thanks also to Mr Geoff W Ikinson, Victoria Police Media Director, Chief Superintendent Peter Graham, and his staff for their patience and assistance.

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1 D24 A New Concept in Communication Technology Bett McLachlan, *Amateur Radio* Volume 60, No 8. August 1982.

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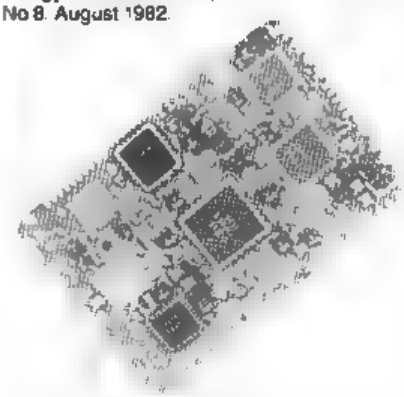

Close-up view of the internal microcomputer board.

HURRICANE GILBERT DISASTER

Jim Linton VK3PC
4 Ansett Crescent, Forest Hill, Vic. 3131

All aviation communications and navigation aids were knocked out by the hurricane!

When hurricane force winds ripped through Jamaica in September, news of the disaster was made known to the outside world through amateur radio.

The hurricane left 500 000 of the 2.5 million population homeless, and various reports of loss of life left the death toll unclear.

The United States Federal Communications Commission declared 14.275 MHz an emergency frequency. Numerous amateur radio stations, plus the Jamaican Military call sign, 6Y5B64, and commercial aircraft on disaster relief missions, used this frequency.

All aviation communications and navigation aids were knocked out by the hurricane. Via amateur radio stations, the Red Cross and US State Department also relied on the channel to get emergency traffic through. International Amateur Radio Network (IARN) Australian Director, Sam Voron AX2BVS, was net controller of the 14.275 channel on several occasions, due to propagation between Jamaica and the US being non-existent.

Sam also assisted the National Hurricane Centre, in Miami, which used the frequency, 14.325 MHz. The Centre broadcast updates of hurricane warnings continuously as the 500 mile-wide hurricane moved through the Caribbean. Keeping in contact with an observation aircraft over the hurricane, the Centre was frequently heard under the call sign, W4EHW. It gathered amateur radio reports of wind velocity and temperatures as Gilbert travelled through the region.

The IARN sent five radio amateurs into the disaster area to set up emergency communications, and another radio amateur from Canada was separately involved.

The Radio Society of Great Britain was also understood to be considering sending two radio amateurs to help with communications. The British RAYNET organisation handled official traffic for the British High Commission in the early stages of the disaster.

The Deutshe Amateur Radio Club also helped provide a link with Jamaica for a US Army station in West Germany.

In Australia, the Australian Traffic Net (ATN), through Sam, Ken VK3CKK, Harry VK6AP, and Ray VK6RQ, handled over 100 third party health and welfare messages. This traffic from the general public was relayed via the USA as Australia does not have a third party traffic agreement with Jamaica.

The Australian media ran reports of the amateur radio involvement giving the hobby some well deserved publicity.

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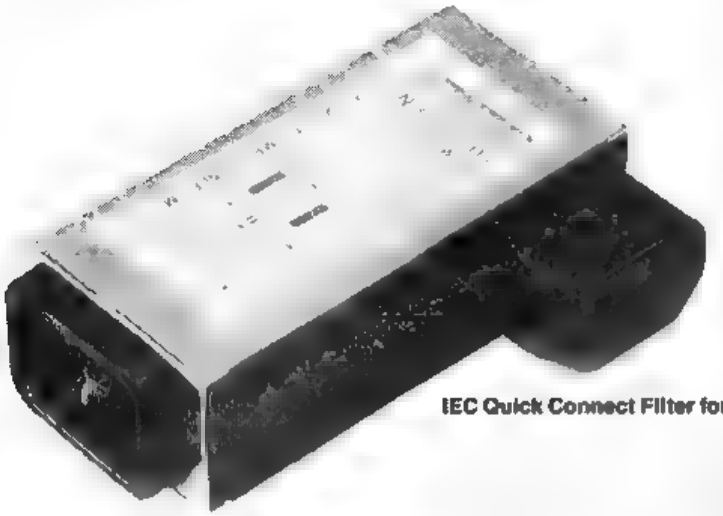
Electromagnetic compatibility

Make your system comfortable

Fred Rode VK3AFR
Sales Manager, Industrial Products
Westinghouse Systems
PO Box 269, Williamstown, Vic 3016



IEC Quick Connect Filter for Service Work.

Increasing environmental pollution caused by solid, liquid and gaseous waste is readily perceived by the human senses. Environmental contamination by electromagnetic energy also is steadily increasing but, as the human senses are not attuned to perception of this energy, the pollution is less obvious. Man-made electric systems, which are designed to operate within the electromagnetic environment, suffer the most harm from electromagnetic pollution.

The expression "electromagnetic compatibility" (EMC) defines the capability of electronic equipment or systems to be operated in the intended electromagnetic environment at design levels of efficiency. This article reviews some of the more frequent hazards to EMC.

INTERFERENCE SOURCES

Quite frequently, designers of electronic and computer control systems ignore the very harsh environmental conditions commonly found in heavy industry. Unless protective measures are taken, erratic operation of the hardware systems — even total failure — can result.

Four fundamental interference sources are:

* man-made noise (from electrical consumers);
* electro-mechanical pulses through nuclear reaction;
* atmospheric events (from lightning, electrostatic discharges); and
* cosmic noise.

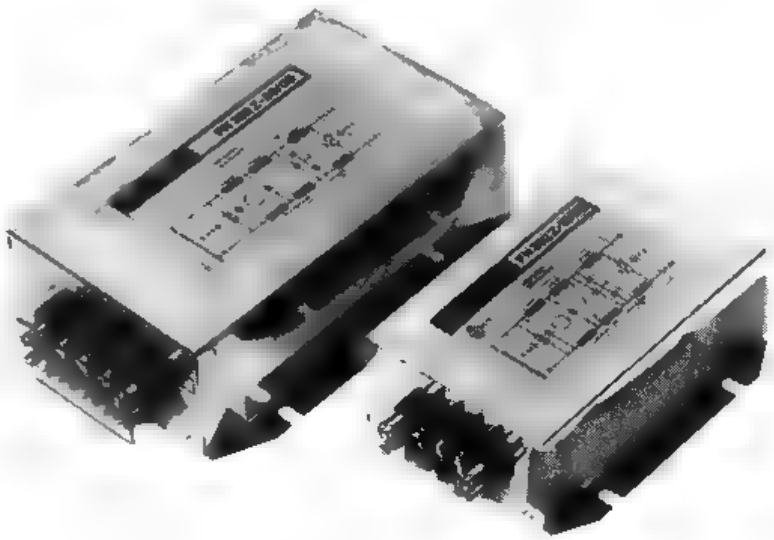
SUSCEPTIBILITY

Since the control system designer has little control over the environment in which his equipment will be working, it is important that he should determine to what degree the equipment is susceptible to interference. Levels of susceptibility often are determined both against erratic operation and against total failure of hardware. For this purpose special test equipment (such as the Schaffner range supplied by Westinghouse Systems) is available for pulse, high voltage and other simulation testing of process control and electronic equipment.

SUPPRESSION MEASURES

The most cost-effective means of attenuating an interfering signal are those steps taken in the design phase of a project. Later, so-called "improvements" may be at least very expensive and, in some cases, impossible to achieve.

Variety of Power Line Filters from one Amp to 10 Amps.



A Very High Performance Filter with Surge Protection. Maximum Current 30 Amps.

Many methods of suppression are available t the designer These nclude

* the use of optocouplers. solation transformers, twisting conductors, fibre optics, suitable power line or signal line filters.
* separation of wiring; shielding;
* EMC hardened design of system, including the design of printed circuit boards, and
* mpediment of electrostatic charges (by increasing air humidity, or by use of conductive working surfaces, for example).

FILTER SELECTION

When a filter is required, further factors need the designer's consideration.

How much nsertion loss will be required over the frequency range of interest? Often, the high attenuation, a multiple-stage filter must be used. Where a switch-mode power supply is involved, very high loss at lower frequencies is important.

It is important, too, to match the power supply current-rating of a filter to that of the equipment: when a switch-mode power supply s used, it is essential to consider that peak currents often are 10 times the average current. For this reason, the system requires filter chokes which will not saturate when such conditions arise.

A filter with an earth line choke must be specified when the conducted nterference is asymmetrical.

It is also possible to absorb the very high energy of power supply voltage spikes by transient voltage suppression. Some filters have such suppressers fitted.

Finally, the wide range of filter sizes can be considered. These vary between filters suitable for an entire cabinet of equipment and, compact units which combine an IEC power connector, fuses and switch. Schaffner filters, from Westinghouse Systems, are available to suit all applications.

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THE HAPLESS AMATEUR

a true story of the 1988 John Moyle Memorial Field Day Contest

As always, I enjoyed the contest and, as always, something happened to make it a little different. Last year I flattened my battery and, after some pushing and grunting, finished with the car at the bottom of a hill with nowhere to go, the engine not running and the battery still very flat.

This year I took along two extra batteries and, just as I was about to commence operations, two Four Wheel Drive vehicles drew up on the opposite peak at Mount Fatigue and the occupants proceeded to erect an antenna. Arrrh bother, another field day operator on the same site and lots of QRM! But no, it was Col VK3BLE, and assistants erecting the antenna for a CB UHF repeater. Phew!

But then, at lunchtime, about 12 horsemen (and horsewomen and horsechildren) accompanied by several dogs appeared out of the bush and made straight for the disused CFA tower that I had selected to fix my antennas to. It was quickly apparent to the head horseman that I was in their way. "Them wires are in the horses way" he observed in a meaningful manner. "Well, someone has a problem," I retorted and, looking up at the milling posse, decided on positive action. "I'll move them in a moment" I said.

So, concluding the QSO I had been engaged in, I rolled up the radials for the 10 metre-high vertical. I decided to leave the three lengths of coax on the ground and chance any damage from the horses hooves. Likewise, especially as the horses were now tethered all around me, it seemed wise to leave the rest of the antenna farm (a dipole and two metre vertical) where it was and return to the rig and hope that none of the horses were inclined to kick. Fortunately, they seemed satisfied merely to graze and leave the occasional calling card where I might find it when packing up.

It was about this time that two of the dogs took a violent dislike to each other and it was only good luck that they chose to do most of their fighting on the far side of my car, rather than beside the batteries and card table on which the station sat; and where they had previously been lying.

Nevertheless, I had several anxious moments as they stood either side of my set-up expressing contempt for each other before returning to the fray.

When several bikies, a pair of pensioners and a honeymoon couple also joined the crowd I realised that I was not really as far out in the bush as I had thought.

In due course, some of the horseriders cautiously engaged me in conversation and w th n a few minutes a friendly discussion on horses and amateur radio was underway. Some strong, clear signals from Japan impressed the younger members of the group and I regretted not having some WIA information sheets on hand.

After about an hour they saddled up and I was left one again to the tranquillity of the mountain top.

—The experiences of Ron Cook VK3AFW, contributed by Frank Beech VK7BC

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REPORT ON SPECIAL CALL SIGNS

Since publish ng the Report to Executive on Special Call Signs as printed n August AR page 10, the WIA has received a query as to its accuracy.

The suffixes list was prepared w th assistance from DOTC and a copy has been referred back to DOTC Central Office, for comment.

To date no reply has been received, so the matter will be placed on the agenda for the next DOTC/WIA joint meeting.

It has been noted that a draft of the new DOTC 72 pamphlet appears to be a copy of the WIA's suffixes list, unfortunately with a transcription error. Readers will be advised of any corrections made by DOTC, when they come to hand.

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RUSSIA EMBRACES AMATEUR RADIO FOR YOUTH

The Soviet Union was promoting school radio clubs in recognition that it was one way of developing the technical creative abilities of the nation's youth.

Editor-in-Chief of the Russian magazine *Radio*, A Gorokhovsky said a special resolution aimed at further development of the technical ability of youth, was recently adopted by the Council of Ministers of the USSR, All-Union Central Council of Trade Unions, and other organisations.

Encouragement was being given to amateur radio clubs which were in many high schools, universities and polytechnical institutes.

In a letter to Ron Smith VK4AGS, the WIA Queensland Education Officer, Mr Gorokhovsky said teacher training colleges had included in their social sciences faculty training, basic knowledge on how to organise and manage a school amateur radio station.

When graduating as teachers they were equipped with the knowledge and skills to involve school children in amateur radio activities.

This sounds like an excellent idea and something Australia could adopt to lift the technical awareness of its youth.

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SOLDERING STATION SAFETY RECALL

Dick Smith Electronics has recalled a temperature controlled soldering station because of a safety risk.

DSE said the power switch in some of the units had been found to be incorrectly wired. The model involved was the Dick Smith Electronics catalogue number T-2000.

The units which may be affected were fitted with a meter having a white, translucent background and bear the Australian Design Registered Number 86081.

As a matter of urgency, the units should be returned to the nearest Dick Smith store for immediate attention.

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RSGB PROJECT YEAR

In recognition of the low number of under-18 radio amateurs, the Radio Society of Great Brita.n has initiated a special project called YEAR (Youth into Electronics via Amateur Radio).

RSGB Secretary, David Evans G3OUF, said the aim was to create and develop, among young people, an interest n science, engineering and electronics by introducing them to the hobby o' amateur radio.

"Major UK electronics-based companies report severe shortages of manpower. RSGB has conceived project YEAR to help alleviate this problem," David said.

One prime objective of Project YEAR is the development of a new licence grade. The licence would be designed to encourage students and beginners into the hobby with Novice type privileges.

An outline of Project YEAR was given to industry, government and armed forces representatives at the recent RSGB 75th Anniversary Convention.

RSGB 75TH ANNIVERSARY

The Immediate Past President of the Wireless Institute of Australia, David Wardlaw VK3ADW, has recently returned home after an enjoyable overseas trip.

Whilst in England, David attended the 75th Anniversary Celebrations of the RSGB, representing the WIA during this auspicious occasion. (Coincidentally, David also attended their 50th Anniversary in 1963). During the celebrations, David presented a special plaque to Sir Richard Davies KVCO, CBE, C.Eng FIEE, G2XM, the President of the RSGB, expressing best wishes from the WIA to the RSGB.

The main event of the celebrations was the 75th Anniversary Convention which was held from July 15 to 17, at the National Exhibition Centre, near Birmingham. The Convention was opened by His Royal Highness Prince Philip, Duke of Edinburgh, KG, the Patron of the Radio Society of Great Britain.

In opening the Convention, the Duke congratulated the RSGB on their achievement of 75 years existence and service to the amateur service, which had been pioneered in the United Kingdom. Whilst not an amateur, he said he had caused many messages to pass to and fro on the air, and during his time in the Navy was well acquainted with the "jabber box"

After officially opening the Convention, the Duke toured the exhibition before proceeding to the 75th Anniversary Luncheon. At the luncheon, a feature was made of the launching of Project YEAR (Youth into Electronics via Amateur Radio), an entirely new initiative to create and develop, among young people, an interest in Science, Engineering and Electronics by introducing them to the hobby of amateur radio. Amateur radio encompasses not only Electronics, Science and Engineering, but also IT (Information Technology) Principles, Languages, Travel and Geography. It also enables participants to enjoy a high quality of personal communications. Indeed, amateur radio is already a proven training ground for young people and is seen as a creative and disciplined form of practical preparation for their future careers.

From left: David Evans G3OUF, Dick Baldwin W1RU, John Allaway G3FKM and Nigel Roberts G4IJF, at the International Meeting which was held during the RSGB 75th Anniversary Celebrations.

On the Saturday, an informal IARU meeting was hosted by David Evans G3OUF, Secretary/Chief Executive of the RSGB, and John Allaway G3FKM, Secretary of the IARU Region I, and chaired by Dick Baldwin W1RU, the President of the IARU. Representatives from 17 countries were present.

One of the major topics discussed was the preparation for a major ITU Frequency Allocation Conference, which is likely to be held in 1992 or 1993.

General consensus was that a uniform policy for all IARU Societies is essential, and the amateur service, through the national societies, must become involved in the preparation by their own administrations for the Conference, if this is at all possible. The IARU Regions must also develop funding strategies for IARU participation in the Conference, and, where possible, the amateur service must be involved with the CCIR, especially as CCIR is usually charged with preparation for ITU administrative conferences.

Other matters covered were EMC and standards, a subject which is becoming extremely important to the amateur service, and the promoting of amateur radio which was of very much concern to all the societies involved in the meeting.

The RSGB is to be congratulated on their very successful 75th Anniversary celebrations.

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David VK3ADW, presented a plaque to Richard G2XM, on behalf of the WIA.

Joan Heathershaw G4CHH, Immediate Past President of the RSGB, Shozo Hara JA1AH, President JARL and Michael Owen VK3KI, Director of the IARU Region III Association, share a quiet moment during the 75th Anniversary Luncheon.

Equipment Review

Reviewed by:

Ron Cook VK3AFW
Lew Whitbourn VK2ZIP

IC-2GAT and IC-4GAT TRANSCEIVERS

Icom seem to have stolen a lead over their competitors in the field of hand-held amateur transceivers with this pair. A quick glance at their features shows why. These two rigs are almost identical twins; the IC-2GAT is for use on two metres FM and the IC-4GAT is for 70 centimetres FM. Unless otherwise stated, comments in this article refer to both units.

FEATURES AT A GLANCE

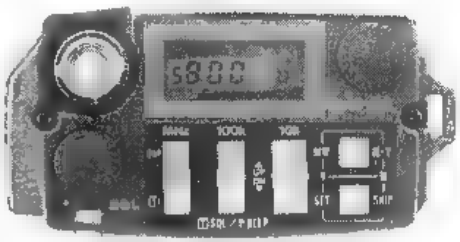
- ★ Small, compact FM transceiver with seven watts output on two metres and six watts on 70 centimetres.
- ★ Splash resistant case with rubber gaskets to prevent water entering the case.
- ★ 20 memory channels plus one call channel. Stores all information required to work any repeater.
- ★ Power saver. If there is no received signal for 30 seconds the current drain is reduced to one quarter of the normal receiver current.
- ★ Programmable frequency scan and memory scan, including the ability to skip selected channels.
- ★ Squelch open button (Squelch monitor function) to allow monitoring of weak signals without disturbing the normal squelch setting.
- ★ Pocket beep function: operated by reception of sub-audible tones (optional).

TECHNICAL DETAILS

FREQUENCY COVERAGE:
IC-2GAT — 144-148 MHz.
IC-4GAT — 430-440 MHz.
TUNING STEPS: 5, 10, 15, 20 or 25 kHz.
POWER SUPPLY: 5.5 to 16.0 volts.
CURRENT DRAIN:
(at 13.2 volts DC) for the IC-2GAT
receiver — power saver — 10 mA typical. Maximum audio — 250 mA.
transmitter — High — 7 (6) watts out — 1.8 amps. Low — one watt out — 0.9 amps.
RECEIVER DETAILS:
Double conversion superheterodyne with 16.9 MHz (21.8 MHz for IC-4GAT) first IF and 455 kHz second IF.
SENSITIVITY:
0.25 uV for 12 dB SINAD. Audio output 400 mW at 10 percent THD into an eight ohm load.
SIZE:
With BP-70 battery pack, 65 x 151 x 35 millimetres, weight 500 grams.
ACCESSORIES SUPPLIED:
Battery pack BP-70, charger BC-18, flexible antenna with BNC connector, hand strap and clip, belt clip and rain proof caps.

CONTROLS AND INDICATORS

With a small unit equipped with so many features, either very small controls must be used or each control must perform several functions. Icom have opted for the latter approach, fitting a *Function* button on the side panel. Pressing this at the same time as another button causes the second function to be executed. The controls are briefly listed and described in the following paragraphs.



TOP PANEL

There are two rotary controls, one for the volume/on-off function, the other for the squelch. A LED indicates when the transmitter is on. A BNC connector is provided for the antenna connection. Three rocker type switches allow selection of the operating frequencies in 1, 0.1 and 0.01 MHz steps. When pushed in one direction the frequency increases and when pushed in the other direction, the frequency decrease. Duplex and tone functions can be actuated through the alternative function mode for these switches. Two push buttons allow frequencies to be written to, or recalled from, memory, VFO/memory mode selection and memory skip operation.

A comprehensive LCD display gives the operating frequency in five digits (the hundreds of MHz are not shown); it also indicates duplex (+/-) or simplex operation, and memory channel number. A most useful feature is the provision of a wedge shaped bargraph display of RF output power level or received signal strength. Tone and squelch monitor operation are indicated by the characters "T" and "SQL". "SKIP" indicates memory skip operation and "LOW" denotes low power transmission setting is on. Unfortunately, no indication of the battery state is given. As the receiver will operate at voltages down to under five volts, reverse charging of some cells can occur in rechargeable battery packs giving 8.4 or 13.2 volts when charged.

SIDE PANELS

The function change button, PTT lever switch, light (for LCD display) button and battery pack release button are fitted on the left side panel.

Sockets for external microphone and speaker are on the right side panel. Sockets for the charger and external power supply are on the side panels.

FRONT PANEL

The loud speaker and microphone are behind this. Along side them are the Call, High/Low and Moni (Squelch monitor) buttons. In the duplex mode the Moni button allows monitoring the repeater input frequency. Beneath is an alphanumeric keyboard with 16 buttons which is used exclusively for DTMF audio tone transmission.

INSTRUCTION MANUAL

As with most modern instruction manuals, the one provided with this unit is well laid out with copious diagrams to aid the owner. It is necessary to read the manual to be able to access all the functions.

ON-AIR

The small size and light weight make this a delight to carry around. The sensitivity was found to be excellent and the higher power certainly cured the problem of being noisy into out-of-town repeaters.

A most appreciated function was the received signal strength indicator. No more experimenting to find the best position to get back into the repeater. No need to press the button to see if you are getting in either as a strong received signal indication is sufficient to ensure that you will get in.

Also, the ability to use the hand-held from the car battery without requiring a pre-regulator is a bonus. One of the reviewers has had a small box containing a pre-regulator, battery charger and PA to allow use of his hand-held in the car for extended periods. The extra box and associated cables are a nuisance that can now be done without. Of course, you will need to purchase the AD-12 external power adaptor which slides on in place of the battery pack. The extra power available when operating from the car is also very useful.

The recovered audio is of good quality and sufficient for most applications. In some vehicles, a larger speaker may be required for mobile operation, but in most the available level from the in-built speaker will be adequate.

ACKNOWLEDGEMENT

The review equipment for the section of the review was kindly made available by Icom Australia. Inquiries should be directed to Icom or their authorised agents.

FURTHER THOUGHTS ON THE IC-2GAT by Lew Whitbourn VK2ZIP

I have extensively used quite a number of synthesised hand-held radios: Icom's IC-2 thumb-wheel tunable model, their IC-02 microprocessor controlled radio, Yaesu's FT-203, 207 and 209, as well as Kenwood's TR-2400 and TR-280, and/or UHF versions of all these. I have not yet used any of the super-tiny multi-function radios that have recently appeared on the market, such as the IC-μ2A, FT-23 and TH-25, so I cannot compare the IC-2GAT with any of those. However, the IC-2GAT is the best hand-held radio that I have ever used and it is certainly one that I would like to own. Nevertheless, there is always room for improvement. In the following sections I draw attention to areas in which the IC-2GAT excels and to others in which it could be even better.

FEATURES

It is good to see that Icom have, at last, decided to give us their top-of-the-line VHF hand-held, with sub-audible tone encoder and DTMF facilities included. (There are versions of the IC2-GAT without these). The emergence of a DTMF controlled digital voice bulletin board in Sydney is an indication of future trends. DTMF has many possibilities, with decoder chips readily available at Tandy Store for around $24.95 these days. Also I find sub-audible tone and encode/decode to be the most widely accepted and least obtrusive of selective calling systems. A very interesting option is a sub-audible tone decoder with 'tone-beep' operation, allowing the radio to be used effectively as a pager.

OPERATION

Icom have achieved a very large number of functions with a relatively small number of keys. The trick is to have "modes" of operation. The VFO, MEMORY and SET modes are the main ones. Most keys have different uses in the different modes and then there is a "function" key which gives a second function to most keys in most modes. You can toggle between the VFO and MEMORY MODES by pressing the V/M button and get into the SET mode from the VFO mode by pressing FUNCTION + V/M. This may sound complicated but I very quickly found it very user friendly. Operation is largely menu driven, especially in the SET mode, which is used to set sub-audible tone (from 38 standard frequencies), repeater offset, tuning step, scan limits and power saver ON/OFF. There is one other "official" mode, the CALL channel mode which you can toggle in and out of with the CALL button.

There is also, what I call, an "unofficial" mode, the SCAN mode. When the radio is scanning, most keys serve only to stop the scan, so that is a different mode of operation of the keys.

MEMORIES AND SCANNING

All 20 memories can store individual offsets, sub-audible tones, scan skip status and tone beep status. There are two separate memories for scan limits and there is a separate call channel memory. This is all great. In memory mode the radio can scan all the memories or skip any designated channels. In VFO mode it will scan between the scan limits set up in the SET mode. I like all this too, but I think it could have been done better.

To start scanning, press FUNCTION and the 10 kHz up or down keys. When scanning, the radio looks for, and stops on, a busy channel. Scan resumes after two seconds of inactivity on that channel or after 15 seconds, regardless of activity. This is an unusual mode of scanning, quite different than that used by Icom in their IC-02, and not particularly to my liking. If you want to stop on a particular busy channel, pressing almost any key suffices, which is fine. However, if you want to scan-on you must either wait 15 seconds (which can seem like forever on some channels) or stop the scan then restart, which takes two hands. It is alright the first time, but it gets you down after a while! It would have been possible in scan mode for Icom to designate keys for pause, resume and stop, rather than all stop. This would be a great improvement. Whilst I am making a wish-list, the feature I have always hoped for is a scan between limits where some or all memories can be used to define channels (or sub-bands) to be skipped. *Go to it Icom!*

I did notice one interesting peculiarity with band scanning. If the current VFO frequency is not between the defined scan limits, A and B (which are set up in the SET mode as described earlier), the radio first scans to one or other of the scan limits before starting a cyclic scan between the two limits. This is quite puzzling at first. You can have scan limits at, say 146 and 147 MHz. If you happen to be at 147.5 MHz and press function and 10 kHz up, the radio first scans down from 147.5 MHz to 146 MHz! It is not a problem once you know about it, but I wonder whether this is a software bug or whether Icom have some reason for programming this behaviour?

RECEIVER

I measured the receiver sensitivity to be 0.15 μV for 12 dB of quieting (and 0.25 μV for 20 dB) from 144 to 148 MHz, which is exceptionally good. The receiver showed no signs of distress when connected to a base aerial, a half-wave 13 metres above ground level, less than 10 kilometres from, and line-of-sight to, the taller buildings of Sydney on which many commercial VHF and UHF services are located. Note also that the American version of the IC-2GAT receives from 138 to 174 MHz. (The only difference is a diode or two in the microprocessor initialisation matrix). For such a broadband receiver the performance described above is outstanding. Icom have achieved this performance by using four varicap-tuned tracking filters in the receiver front-end. The DC tuning voltage is derived from the VCO voltage of the PLL frequency synthesiser. The same system is used in Yaesu's FT-23, which can receive up to about 163 MHz.

Tight squelch opens at 0.1 μV or a little less. The LCD signal strength indicator has seven bars, which correspond to the following ranges of signal strength: 0.1 - 2.0, 2.0 - 2.3, 2.3 - 2.7, 2.7 - 3.0, 3.0 - 3.4, 3.4 - 3.7 μV, and from 3.7 μV upwards. These ranges correspond to 26 , 1.2, 1.4, 0.9, 1.1 and 0.7 dB respectively for the first six steps. This is hardly the ideal response, but any S-meter is better than none.

Measured current drain on receive was 40 mA at 10 volts, with the receiver squelched, rising to 70 mA unsquelched at moderate audio level. The power saver comes in after 30 seconds of inactivity and has a 0.6 second cycle time. The current then drops to about 11.5 mA (the needle of my multi-meter was dancing between 10 and 13 mA). The power saver does not operate during scanning. You are, in fact, never aware of its presence but you would become aware of the very low current drain if you were monitoring a single channel for long periods. According to Icom, the only reasons for ever turning it off would be for reception of various data modes.

RECEIVER AUDIO

Received audio from the IC-2GAT was excellent. In fact, better than I have heard from a hand-held for some time. The trend with microprocessor controlled hand-helds has been to use smaller and smaller speakers in order to squeeze in all the other features. Icom have finally reversed the trend. There is plenty of audio output and it sounds good through the internal speaker. The audio level is actually acceptable in a not-too-noisy vehicle. This pleasant surprise is reflected in the specifications of the radio: 400 mW output into 8 (at 10 percent distortion) for a total transceiver current of 250 mA. As usual with Icom, you can get the audio out. There is the standard Icom pair of speaker/microphone sockets on the right-hand side of the radio.

For comparison, the IC-2 had 300 mW of audio (at 140 mA) and the IC-02 was rated at 500 mW audio (also at 140 mA). The audio from the IC-2 was quite good and that from the IC-02 was awful, and certainly did not sound like 500 mW even through an external speaker. Readers suffering from this may be pleased to know that the audio quality can be improved dramatically by changing a capacitor in the audio frequency de-emphasis circuit, C117, from 0.22 μF to 0.05 μF. I am grateful to Bob Morrow WB6GTM, for this information. The same cure works for the IC-04. Make sure you get the right capacitor though, C118 is connected to C117, is right alongside it and is also 0.22 μF!

TRANSMITTER

Icom state that typical powers with the BP-70 (11 cells: 13.2 volts at 270 mAh) and BP-3 (seven cells: 8.4 volts at 270 mAh) battery packs and seven watts and 3.5 watts respectively. I measured corresponding powers of 7.5 and 3.9 watts with freshly charged packs. Working through all the figures in the handbook I deduced that the current drains powers and overall

efficiencies for the BP-3, BP-70 and BP-5 (nine cells: 10.8 volts at 450 mAh) are:

	P (W)	I (mA)	Efficiency (%)
BP-3	3.5	1350	34
BP-5	5	1500	32
BP-7	7	1800	30

The efficiency is fairly constant. On low power the IC-2GAT seems to give about about one watt (I measured 0.9 watt for both BP-3 and BP-70 packs) for any battery pack, at a current drain of about 0.9 amps or an efficiency that varies from 13 percent for the BP-3 to eight percent for the BP-70.

It is interesting to compare this performance with that of earlier Icom hand-helds. The IC-2 gave a guaranteed power of 1.5 watts with a BP-3 (8.4 volts) for a current drain of 600 mA, with a corresponding overall efficiency of 30 percent. The IC-02 gave three watts with a BP-3 for a current drain of 1.05 amps, yielding an efficiency of 34 percent. However, well tuned IC-2s gave 2 to 2.5 watts for about the same current drain, or overall efficiencies up to about 50 percent. I suspect that the difference is that the IC-2 used discrete devices whereas the IC-02 and IC-2G use broadband high power chips for RF power generation.

BATTERY PACKS

You need at least two battery packs with a radio like the IC-2GAT and Icom offer a wide variety to choose from:

TYPE	CELLS	VOLTAGE	CAPACITY (mAh)	LENGTH (mm)
BP-2	6	7.2	450	39
BP-3	7	8.4	270	39
BP-5	9	10.8	450	56
BP-5A	9	10.8	450	80
BP-7	11	13.2	450	80
BP-8	7	8.4	800	80
BP-70	11	13.2	270	61

The capacities quoted here are from the handbook supplied with the radio and some are a little higher than quoted by Icom elsewhere. For instance, the BP-3 is usually rated at 250 mAh and the BP-2, BP-5, BP-5A and BP-7 at 425 mAh. I measured the capacity of the BP-70 supplied with the radio to be 280 mAh at a discharge current of 40 mA.

Although the BP-70 is about 20 millimetres longer than the BP-3 supplied with most earlier Icom hand-helds, the shorter body of the IC-2GAT more than compensates for this with the result that, with the BP-70 it is still about 10 millimetres shorter than the IC-2 or IC-02 with a BP-3. To my eye the IC-2GAT looks about the right size with the BP-70 and the BP-3 makes it look short. However, I am not keen on drawing 1.8 amps from 11 270 mAh cells in series — some are bound to end up reverse polarity (and probably short circuited) eventually. My choice for a second battery pack would be the BP-5, which will still give about five watts and has 450 mAh capacity.

However, the BP-70 battery supplied with the IC-2GAT has two good things going for it. At 61 millimetres long it is long enough to fit eight rechargeable penlight cells (AA size) which can be purchased quite reasonably in 500 mAh or even 600 mAh capacity and could be used to replace the original 270 mAh cells. Also the BP-70 has two sockets, one for a one millimetre DC coaxial jack for charging and the other for a two millimetre DC coaxial jack labelled 13.8 volts. At first I thought that the latter socket was to allow external power to the radio. You can even hear an internal relay click over when you plug a 13.8 volts source into the two millimetres socket. However, I discovered in the handbook (and verified) that both sockets are for charging and the relay clicks over when power is applied to either socket. When being charged, the BP-70 only lets enough current through to the radio for receiving. The relay must be responsible for this.

I cannot say any more about this strange behaviour because the circuit of the BP-70 is not supplied with the radio. Quoted charging time for the supplied BC-18 charger, which is a 12 volt 300 mA plug-pack, (17 volts open circuit), is nine hours, so the BP-70 must limit charging current to 45 mA. No time is quoted for charging through the 13.8 volt socket, but I wouldn't recommend using it for charging because 11 nicad cells will rise to about 15.4 volts when fully charged, so current regulation over the charge cycle would vary from difficult to impossible. Current regulation from the BC-18 would not be much better. However, the good thing about the BP-70 here is that, with two sockets and an internal relay included you could easily rewire it to allow external power to the radio through one socket and safe (ie externally regulated/monitored) charging through the other.

SUMMARY

Don't be put off by my fault-finding. I love the IC-2GAT. It has a very sensitive, well-behaved receiver, lovely audio and plenty of RF power if you want it. It has sub-audible encode (optional decode), DTMF and 20 full function memories. All the accessories for the IC-2 and IC-02 series radios still work with the IC-2GAT. The back-lit display is beautiful — I only wish you could leave it switched on for base and mobile use! My review unit was kindly supplied by Practronics, PO Box 47, Peakhurst, NSW, phone (02) 533 2753.

ABOUT THE AUTHOR:

LEW WHITBOURN VK2ZIP, was first licenced as VK2ZLB in 1975. While living in Melbourne and Canberra since then he has also had the call signs VK3ZSQ and VK1ZLW, respectively.

His work involves research on long-wavelength lasers and optical techniques (300 GHz to 30 000 GHz) and he has worked for several two to three year terms at a number of universities and laboratories throughout Australia and has also spent a period in France. Currently he works for the CSIRO Division of Exploration Geoscience, at North Ryde, New South Wales, on development of an airborne carbon dioxide laser system for active remote sensing of minerals.

Lew's main interest in amateur radio is in the design and construction of antennas, and analogous optical systems, which present a fascinating combination of mechanical and electrical constraints and are readily tested at VHF and UHF. He is also interested in propagation at these frequencies and in the technology of hand-held radios. He operates occasionally on the two metre, 70 centimetre and 477 MHz FM bands.

Other interests include sailing, French, computers and, as a matter of necessity, car maintenance!

OPEN LETTER. . .

AMATEUR OPINION & THE WIA

The following letter was recently written to the Editor of Amateur Radio Action *by a member of the Executive of the WIA. We thought that members of the Institute would also like to read George's excellent comments.*

I would like to thank you for the objectivity and constructive tone found in the July issue. May I offer my thoughts on what appears to revolve around the issue of whether there should be a WIA, and why it should be supported?

Yes, I am also mindful of some operational deficits on the part of some organs of the the WIA, and in my view, the steps needed to correct those deficits are equally as important as loyalty to the Institute.

The critical factors as I see them are:

a) The amateur service depends on permission being granted to us to use the spectrum resource notwithstanding the pressure from government, commercial and broadcasting interests,

b) The only recognisable form of protection from further encroachments into our bands, would appear to be bodies like the WIA which act directly at the national level, and internationally through affiliations like the IARU;

c) The WIA is responsible for a reasonably well co-ordinated band, repeater and beacon plan across Australia, and had it not been for the confidence which the WIA has been able to win with the government, we would not be a self-regulating radio service. We would become a little like the Irish — subject to direct rule by Federal legislation;

d) Whether critics like to admit it or not, the WIA is the body responsible for a host of member services, and it is obvious that many people have allowed personality clashes and disenchantments to intrude, and therefore such personal issues have clouded the more fundamental questions like the need for a strong body representing the amateur population, and where necessary, the promotion of improvements within the WIA;

e) The WIA has not been as effective as it should have been, both Federally and at State level, in letting people know just what it has in fact been doing — in other words, in communicating its achievements to members and non-members.

From the above it can be seen that I am committed to a strong and effective WIA, and it disturbs me greatly to read that there are sections of the amateur community who still assert that they cannot see what they get for their money.

One would have thought that the issue of whether we are to be allowed to retain portions of our bands, or whether there are to be affordable examinations for aspiring entrants to the hobby, were of obvious and critical importance.

I fear that the drop in voluntary membership stems from personal conflicts; from pet peeves that an individual may feel he is unable to raise with the Federal Executive; a feeling that in dealing with a complex multi-level structure, an individual may seem to have little impact.

This sense of remoteness must be fought, and it behoves every member of the WIA to take care in electing their councils, and in giving their representatives accurate and substantial instructions on how they should vote at the annual Federal Conventions, or in conveying members' views on any other occasion.

It must also be recognised that a feeling of remoteness can creep in through one's own apathy — through leaving it to others to make all the decisions.

You see, the problem is not just in the structure, but also in the performance — not just of the elected representatives, but of the membership itself.

Evolution of the WIA is one of the current projects. Evolution at the Federal Executive level has started to be introduced.

Today we see at the Federal Office, an outstanding professional manager in Bill Roper VK3ARZ. The new President, Peter Gamble VK3YRP, is a senior manager within a statutory body, who brings refreshing drive and skills. His deputy, Ron Henderson VK1RH, brings organisational skills and talents which allow a diverse executive body to deal with a daunting workload.

This year the Federal Councillors, who are the Divisional representatives, elected four more non-Melbourne residents, who bring with them experience in finance, local government, public administration and law. That is not to say that the composition of previous executives was not satisfactory, but it is a way of bringing the Federal Executive perceptively closer to the membership. It is to be hoped that not only will quality of service be reflective of the enthusiasm which new people bring, but that those of us who have the privilege of serving on that executive, will be driven by the patent need to communicate with our members.

I see merit in a structure in which individuals may become members of the Federal body called the Wireless Institute of Australia, which would provide member services through clubs. I see nothing wrong with existing Divisions continuing to exist as holding companies, looking after assets acquired by their present members. If members are to belong directly to a central body, then it follows that expressions of opinion could be conveyed through regional (even Divisional) representatives, through either a form of proportional representation, or by delivering results of consultations with numbers "for" and numbers "against" a proposal.

Such a structure could suffer less from personality clashes, as the overall interests of the amateur fraternity would be preserved by people having to make decisions on a nation-wide basis. One could belong to the Institute even if one did not accept the local committee, council or club.

My own portfolio is the Future of Amateur Radio Working Party, and I am interested in hearing proposals from any amateur, whether a member or not, on what amateurs feel about the WIA, in particular what would attract them to join, or what changes would be seen as improvements.

I appreciate I may be inviting a flood of letters, and indeed I hope that will be so, but it is vital that the WIA be retained as the organ, even if in modified form, by which the interests of all VK amateurs will be promoted.

Kindest regards,

(Signed) George Brzostowski VK1GB/VK4UZ
Member of Federal Executive

KNOW YOUR SECONDHAND EQUIPMENT

Ron Fisher VK3OM
3 Fairview Avenue, Glen Waverley, Vic. 3150

After a gap of several months, *Know your Secondhand Equipment* is back with a new series.

However, before starting on the secondhand equipment story, I would like to pass the column over to Steve Mahony VK5AIM, for some interesting comments on equipment insurance. Steve is the South Australian Division's Disposals Officer and runs "Disposals Corner" on the VK5 Sunday Broadcast. Over to Steve.

"A problem which arises from time to time, is insurance of the equipment in the amateur shack. As amateurs advertise their presence with their antenna systems, and most have some commercial equipment that has some value, it does attract thefts. So, some kind of insurance is necessary. The problem is the value you should insure the equipment for. Do you insure it at its secondhand market value, or at replacement value? With the prices of new equipment going so high, this can escalate to an amazing amount.

"Take, for example, some average amateur equipment:

FT-707 HF Tcvr	cost $600	Replacement	FT-747 [illegible]
FC-707 ATU	cost $200	Replacement	FC-700 cost $400
FP-700 PSU	cost $250	Replacement	FP-700 cost $500
FT-290R 2m Tcvr	cost $400	Replacement	FT-290 Mk2 cost $950
FT-209 2m HT	cost $300	Replacement	FT-23 cost $600
Secondhand value $1750		Replacement	Cost $3950

"I could add a TH-3 antenna, two-metre 10-element Yagi, rotator with controller, and a 10 metre mast or tower. As you can see, it soon mounts up. Then, when you tell the insurance company the two metre hand-held can be taken anywhere and could be lost or stolen, up goes the risk factor and the premium. If the amateur is really keen and has a linear amplifier, likes VHF and satellites or perhaps packet with a computer, the replacement value can equal the coast of a family car.

"A good many amateurs of long-standing have taken many years to acquire their equipment. Some of it might be more than 10 years old but still working well. Many insurance companies consider electrical and electronic equipment 10 years and older not worth covering. It only takes a neighbour's house to be burgled to make you realise that is could have been you!"

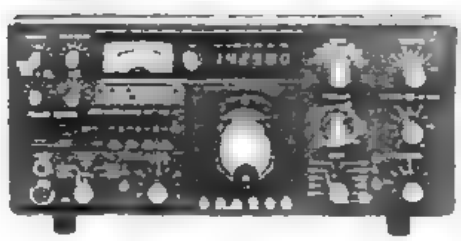
Thanks Steve for those wise words and certainly a phone call to your insurance company to clarify your own situation would be very worthwhile. Whilst on the subject, make a note of what you have, the serial numbers plus any particular distinguishing features and then photograph it. The more information you have, the better the chances you have if something goes wrong.

Now, back to secondhand equipment.

This month, I intend to describe some Yaesu equipment of the late-1970s and early 80s.

YAESU FT-101Z

This HF transceiver was released in early 1979 as a replacement for the aging FT-101E/F series. The cost was just on $800, but the cooling fan was an optional extra. This model covered the pre-WARC bands from 160 to 10 metres and was of conventional design for the times with a full solid-state circuit with the exception of the final and driver stages of the transmitter which used 6146s and a 12BY7. In general, the performance was way ahead of the earlier 101 series with very pleasant sounding received audio. To aid reception, a variable bandwidth control was provided. The clarifier was usable on both transmit and receive — 6 dB of negative feedback was applied across the transmitter final amplifier to give a very clean transmit signal. The AC power supply was built in and an optional 12 volt DC supply was available which bolted onto the rear panel. A reasonably effective RF speech processor was included. I would put the 101Z slightly ahead of its main competitor, the Kenwood TS-520S. Secondhand value for an early model 101Z would be about [illegible].



YAESU FT-101ZD

Released a few months after the 101Z, the "D" model was the same in all aspects except for the inclusion of a bright orange digital display. The cost was around $900. The digital display was also available as a kit to fit into the standard 101Z. When fitted, the two transceivers were identical except for the name plate.

Secondhand value of an early model 101ZD would be about $625. The general performance of the 101ZD is comparable to the TS-820S.

YAESU FT-101Z/ZD MkII

These models were updated to include the new WARC bands and came onto the market about September 1980. The retail price was about the same as the earlier models but the secondhand value is slightly higher. The WARC version of the 101Z would be about $550 and the digital version about $650.

YAESU FT-101Z/ZD MkIII

Released in early 1981, the MkIII offered FM in place of the AM operation and also an effective notch filter. This was the last and certainly the best of the series and is comparable to the Kenwood TS-830S. Secondhand value for a good 101ZD MkIII would be about $750.

YAESU FT-901DM

Actually released before the 101Z, the 901 appeared in September 1978. It was dubbed as the "Competition-Grade" transceiver. External appearance was very similar to the later 101Z series, but the internal construction and operating features were more comprehensive. The modes offered as standard were SSB, CW, FSK, AM and FM. In addition to a bandwidth control, a notch filter was [illegible].

Squelch for FM, audio peaking for CW and an automatic microphone control system to minimise background noise transmission. This worked on the basis of an adjustable threshold setting for the microphone amplifier. A digital readout was included as part of the package. However, the readout had to be "calibrated" against the crystal calibrator every time the mode (USB to LSB) or the band was changed, not a very satisfactory system. The "M" in the DM indicated that the memory system was fitted. This allowed one frequency to be memorised for use on either transmit, receive or transceive. A transmitter tune-up mode was coupled to a 10 second timer to help prevent damage to the final tubes.

Like the 101Z, the 901 had a built-in AC power supply with provision for an optional 12 volt DC supply.

Internal construction was indeed high class, with rows of vertical plug-in circuit boards. This looked very nice, but often proved difficult when service was needed unless you happen to have an extender board. These were large and heavy transceivers, weighing 18 kilograms.

New price, when released, was in the vicinity of $1300. Secondhand value today would be abut $675. If I had the choice between one of these and a late 101ZD MkIII, I would take the 101ZD.

Many accessories were available for the 901 and most of these also matched the 101Z series. These included the FTV-901R VHF/UHF OSCAR transverter. This came with 144 MHz installed with optional boards for 50 and 430 MHz. The FV-901M synthesised scanning external VFO was capable of storing up to 40 frequencies, however they were all on the same band or in the same relative positions on other bands.

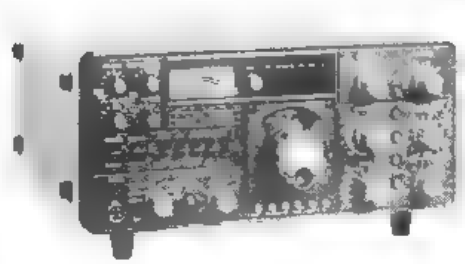
The YO-901 monitor-scope features a variety of monitoring functions which include an optional "band-scope" for received signal display. The FC-901 antenna coupler was rated at 500 watts PEP with a built-in power meter with scales of 25, 250 and 500 watts.

Secondhand value of these would be about:
FTV-901R $200 (no optional boards fitted)
FV-901DM $125
YO-901 $325 or $375 with band-scope fitted.
FC-901 ATU $225.

YAESU FT-902DM

An updated version of the 901DM, it incorporated the WARC bands. The digital readout was improved and did not need to be calibrated. The calibrate control, next to the display in the 901, became the "DIM" control on the 902. Released in mid-1891, at about the same price as the 901, the secondhand value today would be about [illegible].

That's all for this month. Next time we will look at a few more Yaesu HF transceivers.



VHF UHF — an expanding world

Eric Jamieson VK5LP
9 West Terrace, Meningie, SA. 5264

All times are Universal Co-ordinated Time and indicated as UTC

AMATEUR BANDS BEACONS

FREQUENCY	CALL SIGN	LOCATION
50.005	H44HIR	*Honiara*
50.005	ZS2SIX	*South Africa*
50.011	JA2IGY	*Mie*
50.020	JE6ZIH	*Japan*
50.028	JA7ZMA	*Fukushima City*
50.066	VK6RPH	*Perth*
50.075	VS6SIX	*Hong Kong*
50.080	KH6JJK	*Hawaii*
50.110	BY4AA	*China*
50 490	JG1ZGW	*Tokyo* [1]
51 020	ZL1UHF	*Auckland*
52 013	P29BPL	*Port Moresby*
52.100	ZK2SIX	*Niue*
52.200	VK8VF	*Darwin*
52.250	ZL2VHM	*Manawatu*
52 320	VK6RTT	*Wickham*
52 325	VK2RHV	*Newcastle*
52 330	VK3RGG	*Geelong*
52 345	VK4ABP	*Longreach*
52 370	VK7RST	*Hobart*
52.420	VK2RSY	*Sydney*
52.425	VK2RGB	*Gunnedah*
52.435	VK3RMV	*Hamilton*
52.440	VK4RTL	*Townsville*
52.445	VK4RIK	*Cairns*
52 450	VK6VF	*Mount Lofty*
52 460	VK6RPH	*Perth*
52 465	VK6RTW	*Albany*
52 470	VK7RNT	*Launceston*
52 485	VK8RAS	*Alice Springs*
52 510	ZL2MHF	*Mount Climie*
144.022	VK6RBS	*Busselton*
144.400	VK4RTT	*Mount Mowbullan*
144.410	VK1RCC	*Canberra*
144.420	VK2RSY	*Sydney*
144.430	VK3RTG	*Glen Waverley*
144.445	VK4RIK	*Cairns*
144 445	VK4RTL	*Townsville*
144 465	VK6RTW	*Albany*
144 470	VK7RMC	*Launceston*
144 480	VK8VF	*Darwin*
144 485	VK8RAS	*Alice Springs*
144 550	VK5RSE	*Mount Gambier*
144 600	VK6RTT	*Wickham*
144 800	VK5VF	*Mount Lofty*
144 950	VK2RCW	*Sydney*
144 950	VK3RCW	*Melbourne*
145 000	VK6RPH	*Perth*
432 066	VK6RBS	*Busselton*
432 160	VK6RPR	*Nedlands*
432 410	VK1RBC	*Canberra*
432 420	VK2RSY	*Sydney*
432 440	VK4RSD	*Brisbane*
432 445	VK4RIK	*Cairns*
432 445	VK4RTL	*Townsville*
432 450	VK3RAI	*Macleod*
432 540	VK4RAR	*Rockhampton*
1296 198	VK6RBS	*Busselton*
1296 410	VK1RBC	*Canberra* [2]
1296.420	VK2RSY	*Sydney*
1296.440	VK4RSD	*Brisbane*
1296.445	VK4RIK	*Cairns*
1296.480	VK6RPR	*Nedlands*
2304 445	VK4RIK	*Cairns*
2306.440	VK4RSD	*Brisbane*
10445 000	VK4RIK	*Cairns*

1. According to the West Australian VHF Group Bulletin, this is a new beacon. It transmits in mode A1A with an output power of 10 watts to a dipole antenna 35 metres high. The location is downtown Tokyo in Grid PM95VP, it has an operating schedule of 24 hours with the message "VVV de JG1CQA Tokyo PM95VP" Reception reports are welcome v a the Call Book address or Packet JI1CQA and JA1DGZ

2. Ron Henderson VK1RH, sends news of this new 1296 MHz beacon at Canberra. Its location is at Melba, ACT, running five watts to crossed dipoles to yield an omni-pattern. Both the 1296 and 432 MHz beacons were constructed by Dik VK1ZAH and Tom VK1BUD.

SATELLITE CONTACTS

Roly VK3IXW, has been amusing himself via the satellites. He was particularly pleased with a contact he had with James G3RUH, on 12/8 on Mode L (1296 MHz up and 70 centimetres down). Calling on CW he received a 529 report with James coming back on SSB. The contact lasted from 1409 to 1427 UTC. The elevation was only three degrees at 1409 with the azimuth 283 degrees. The calculated path distance was 41559 kilometres at the start to 42013 kilometres at the finish. Roly tries each of the 11 day orbits. On 1296 he uses four 28 element loop Yagis and on 70 centimetres an 88 element J beam. Roly has worked many JA stations, also a 5 x 9 contact on SSB to ZS6AXT He believes there may only be about five VK stations using mode L.

On 22/7 at 1500 UTC, which was only 15 minutes after the launch of OSCAR 13 (day 1) Roly worked IV3WLQ on SSB Mode B at two degrees west. At 1540, he called CQ on RTTY and worked F3EM 5x7 for the first RTTY heard on the satellite on Mode B. (70 centimetres up and two metres down). Power used was about six watts. So far he has not heard anyone on 1296. There has been quite a lot of activity on JL mode, two metres up and 70 centimetres down.

It appears Roly likes to try those things which are a little different from the ordinary!

50 MHz FROM SINGAPORE

A letter from David Rankin 9V1RH/VK3QV, gives details of some unusual DX workings on six metres within IARU Region III.

Working on 50 MHz from Singapore is a very rare occurrence. That it occurred recently has raised questions whether it is the first time, certainly so since the 9V1 prefix No one is sure whether it was done previously using 9M4 or VS1.

Following 18 months of discussion between Yoshi JA1UT, Selva 9V1UV and the President of SARTS in Singapore, and the Telecommunications Authority in Singapore, official permission was given for some limited six metre propagation tests to be carried out using the specially allocated call sign 9V1ES. Both the time/dates of the tests and the frequencies were closely specified. Transmissions could only be made between the hours of 0800 to 1700 local time on days between June 3 to 12, 1988. The time was subsequently increased to past 1700 hours if conditions were good and signals could be heard. The dates were also extended to June 16.

The equipment was brought from Japan by JA1UT and consisted of a Yaesu model FT-625D modified to crystal control transmission on the permitted frequencies of 50.075 and 50.125 MHz, using 10 watts CW/SSB to a six element CL6 DX Yagi at 40 metres. The venue was a hotel in the Tanglin area of Singapore. The beam was mounted on the roof of the hotel, with permission, to provide an excellent take-off.

The team consisted of Yoshi JA1UT and his wife Setsuko JA1UPA, Hideo JA4HCK and Aki JM1BDB, amongst others. They considered the tests were moderately successful and 157 stations were worked. All JA districts were worked with the exception of JA5, but unfortunately no other countries were heard. Contacts were mostly on CW, with some on SSB.

CHRISTMAS ISLAND

As an extension to his six metre propagation tests, Yoshi and his wife put six metres on the air from VK4KCW/VK9X from June 27 to 23, 1988. This station ran more power than 9V1ES but conditions were not so good and only 105 stations were worked, all from JA.

Yoshi also activated VK4CEI/VP9X on the HF bands from Christmas Island for more than 6000 stations on all bands. This included 19 stations on 1.9 MHz, 122 on 3.5/3.8 MHz and 123 on 29 MHz FM

SUMMARY OF SIX METRE DXPEDITIONS IN REGION III

Over the past 10 years, Yoshi JA1UT and his group have carried out the following DXpeditions on 50 MHz.

4/78. VS6HK Hong Kong. 4.78: CR9AJ Macao, the first six metre operation from CR9 8/78. 4D66UT Philippines, 4/79 and 5/79: YB0X Jakarta, Indonesia, first six metre from YB0; 8/79: C21AA Nauru; 12/79 and 1/80 YB9X Bali, Indonesia; 5/80; HS1WR and HS1YL Bangkok. Thailand, 9/80: C21N, Nauru., 9/80; T3AZ West Kiribati, first six metres from T3; 4/81, 8Q7XX Maldives, first six metres from 8Q7; 8/81 CR9JA Macao, 18/82: KE6RD/KH0 and N7DUU/NH0 Northern Marianas. 8/83: XU1SS Cambodia, first six metres from XU1 8/84. BT5RA and BY5RA China, first six metres from BT/BY; 5/85: XX9UT Macao; 6/86: 6Y4RB Zhenjiang, China 6/87 BV0AE Taiwan, first six metres from BV; 6/88 9V1ES Singapore, believed first six metres from 9V1, 6/88: VK4KCW/VK9X Christmas Island

The above certainly represents a magnificent effort on the part of JA1UT, the amateur service owes a great debt of gratitude for such dedication and expense. It is unfortunate from the Australian viewpoint, that all the operations have taken place at a time when we could not expect optimum conditions to prevail in the Southern Hemisphere One presumes it is natural for Yoshi to choose their Summer Es period giving the most chance for contacts over a wide area, although it is noted that, at the peak of Cycle 21, he did operate during the equinox It certainly is hoped that all those who worked Yoshi so have some appreciation of the sacrifices made, after all, Yoshi does not work the area concerned, he makes it possible for others to work some rare countries.

David 9V1RH, concludes by saying that; "Bearing in mind the opening of six metres in various European countries with in the past 12 months, eg F, G, LA, PA0, 9H, amongst others, amateurs within Region III should take stock of the status of the six metre band with in the various countries in the Region and work towards the opening up of a segment in this most interesting part of the frequency spectrum Such work should and must be done by individual interested amateurs encouraging their national societies to approach their administrations to open the band. IARU and IARU Region III Association must then, in turn, co-ordinate and liaise with the member societies to hammer out a consistent plan for the Region.

"Cycle 22 has started with a bang With new countries now being available on six metres it could prove to be an interesting time ahead for the dedicated six metre operators located in Region III." Thanks for the news. David.

EME RECORDS

Six metres seems to be buzzing with EME activity. According to Joe Riesert W1JR, in *ham radio* for

June 1988, Ray WA4NJP, in Georgia, completed a two-way EME contact with Bert KH6HI, Hawaii, on 50.008 MHz using one minute sequencing. The distance was approximately 4530 miles (7289 kilometres). Ray used 1500 watts and Bert 1000 watts. Both stations were using quads of four eight-element Yagis on 35-38 foot booms. Congratulations to Ray and Bert on a great effort.

From the same source comes news that, on October 18, 1987, at 1945, the EME contest expedition to the NRAO Greenbank, West Virginia radio telescope, set a new 13 centimetre (2304 MHz) EME record. As W3IWI/8, they had a two way QSO with John ZL2AQE, in Wellington, New Zealand. The distance is 8658 miles (13 931 kilometres). W3IWI/8 was using a 150 foot dish (!) and 100 watts while ZL2AQE had a 12 foot dish and 18 watts. Congratulations also to these two operators.

With the Americans using 902 MHz, it did not take long for EME to be tried on that band. The first ever EME QSO on that band was on January 29, 1988, between K5JL and WA5ETV for approximately 13 miles (21 kilometres). K5JL used a 28 foot dish and 150 watts while WA5ETV used a 30.5 foot dish and 200 watts.

Joe said he thought that distance would not last long and he was right. On February 7, 1988, Jay K5JL, completed a 902 MHz (33 centimetres) EME QSO with Al WB5LUA, in Texas, over a distance of about 187 miles (301 kilometres). Both stations were running 150 watts and 24-28 foot dishes.

Also, Joe reports 10.368.1 MHz (three centimetres) EME contacts between Rick Fogle in Texas and Lucky Whitaker W7CNK, in Oklahoma, during last February. These attempts are somewhat unusual in that the pair only have one high power amplifier between them! They have a 15 watt TWT amplifier which they mail back and forth to one another. They are trying to obtain another amplifier of course. They have heard each other with Rick using a 10 foot dish and Lucky, a 16 foot dish. Both have their preamplifiers and power amplifiers mounted right at the feed. So far, due to the circumstances outlined, they cannot claim a conventional contact! Good for trying though.

Thanks Joe for the information. It will help to keep the VK boys on their toes.

NOUMEA

Phil FK1TS, from Noumea, has again sent a very interesting letter. The following are his observations on six metres.

"The openings to VK and ZL during early July were quite good and lasted up to two hours, sometimes longer. On 23/7, the band was open all afternoon. At the end of July the band went quiet for a while. On 30/7, I had the rig on 50.110 and thought I could hear some American accents. Not being sure, I went outside and turned the quad around (manual rotation system) to KH6 and signals came up to 5 x 7-9. I then worked KH6JJK, KH6HI and AH6IO. I was listening and calling all night on 31/7 but nothing heard. Early in the evening of 1/8 one could tell something was going to happen, with all sorts of weird noises around the band. I was calling CQ bearing to KH6 on 50.110 from about 0800 to 0850 with no takers. I stopped about 0850 and five minutes later K6MYC/KH6 popped up. He was running one kilowatt to four 50 foot Yagis and was about 5 x 9 +20 dB (he was 5 x 5 when he removed the linear and ran 150 watts). Not long after, AH9AC came up and was talking to Mike K6MYC/KH6 with signals about 2 x 0, in Noumea. Through Mike I asked him to turn his beam and, after about five anxious minutes, he gave me a call, rising out of the noise to about 4 x 1, call signs and signal reports were exchanged and a new country (Wake Island) for me.

"K6MYC/KH6 was still in at 1120 at 5 x 7. We had been talking for about two hours and 20 minutes with little or no QSB. The only reason we finished the contact was that he had to go to bed as he had a moonbounce sched at 1515 and wanted to get three hours sleep. Also, the only reason Mike came on 50.110 was to set up his equipment for his EME sched later that night on 50.005 MHz and heard the H44 beacon 5 x 7; so the call went out on 50.110 MHz." (one more chalk up for the beacons! . . .SLP).

Phil says the current happenings on six metres are a good omen for the next TEP season and the Es period. It will be interesting to see how he got on with his DXpedition to 3D2 in September, ZK1 in October, plus, of course, KH8 and 5W1 August/September.

Some indication of the state of the band (six metres) from Noumea can be gained from the following: 18/5: 0510 VK2XJ; 19/5 0511 VK2XJ, VK2VC, VK2FLI, 1/7: 0656 VK2XJ, VK2FLI; 3/7: 0724 VK2ZXC, VK4ALM, VI88QLD, VK4ZDK, VK4GM, VK4PZ, 6/7: VK2, VK4; 14/7: VK2FLI, 17/7: 0311 VK2, VK4, ZL2TPY; 0429 VK2; 23/7: 0129 to 0252 VK2KAY, ZL2TPY, ZL3NE, ZL2UBG, ZL1BHV, ZL1AKW, ZL1ADP; 0626 VK2, VK4; 24.7: 0115 ZL1BHX, VK2ZXC; 0305 ZL2TPY, ZL3TIC; 25/7: 0522 ZL1ADP, VK4KJL, 30/7: 0744 KH6JJK, 0745 KH6HI, 0749 AH6IO (still audible at 0825 calling CQ); 1/8: 0859 K6MYC/KH6, 0915 AH9AC (Wake Island, 18 watts to three-element quad), 0936 KH6JJK, 0940 K6MYC/KH6 until 1050, and again from 1112 to 1120.

23/7: 0300: Channel 0 Brisbane 51.670 5 x 9; 27/7: VK2RHV 5 x 2 at 0515; 28/7: Channel 0 Brisbane 5 x 9; 1105 weak CW on 50.110 possibly KH6; 30/7: Heard JG2BRI 5 x 0 calling CQ at 0920 on 50.110; 1/8: 0905 heard K6MYC/KH6 working KX6BA, 0906 K6MYC/KH6 hearing H44 beacon 5 x 7 until 0950; 1015 heard K6MYC/KH6 working P29PL.

All this means if we in VK lived 2000 kilometres further east and further north, say with Alice Springs being about where the Solomon Islands are, our whole country could really have a ball on six metres! Oh well, some scientists say we are drifting north. Slowly!

BRISBANE CHANNEL 0

The Brisbane boys are ecstatic now that Channel 0 has disappeared the scene in the Brisbane area. From September 10, Channel 0 became Channel 10, effectively removing the crud which has plagued six metres since Channel 0 commenced operations on July 1, 1965. So now we have TVQ10 instead of TVQ0 Toowoomba, of course, are now the lucky people who will have Channel 0, with DDQ0 instead of DDQ10! Toowoomba is about 160 kilometres west of Brisbane so from a Brisbane viewpoint, is well outside the service area of the station.

John VK4ZJB, sent me an extract from the Brisbane paper *The Brisbane Sunday Mail* which gave details of the changeover and a few hints for people to tune in the station on the new position.

One comment which I found interesting was "With the new Brisbane 10, viewers who have previously suffered from ghosting on Channel 0, will find this problem no longer exists." Phew! That is a wild statement if ever there was one. I have seen more than enough ghosting on Channel 10 in South Australia, after servicing television sets for more than 25 years, to be very wary of making statements like that.

I have many fond memories of the days prior to Channel 0 when we could expect a mass of signals from Brisbane during an Es opening, the distance to VK5 being a prime 1600 kilometres for single hop. As John VK4ZJB says, there will be plenty of stations around this summer; I am very sure there will be, but do remember, 52 MHz can have a fourth harmonic on Channel 10, just like 50 MHz has a fourth harmonic on Channel 9 if you are not [illegible].

Go to it, have a good time. Thanks John. (By the way, John sent me an 811A valve — he thought I might like it for my six metre linear — very nice thought that, although it is interesting to record that the original bottles are still going strong after 18 years!).

THE UNITED STATES OF AMERICA

Bill Tynan W3XO, of *QST*, and "The World above 50 MHz" reveals that their Summer Es period was very good taken over the whole country. There were pockets of poor conditions at times. Bill cites one occasion when the band was open on six metres to Europe from Canada, whilst it was dead at his QTH.

I reported last month on the huge six metre opening across the Atlantic to Europe. Another good opening was on June 25. Bill said, had it not been for the massive opening of June 6, the one on June 25, would be considered quite monumental. But, it pales by comparison in terms of area covered, the strength of signals and the duration.

A number of stations successfully worked a new country, Finland, with OH1ZAA, on June 25, with reports of 559. Areas covered seem to be VE1, W2, W3 and W4. One 27/6, western USA stations were working JAs around 0500. W6YKM worked about 40, while K7KV worked more than 70.

Bill did comment on what he described as some unusual conditions on 18/6 when "K6QXY observed an interesting effect when, at 1845 he heard KH6HI while his beam was aimed at 100 degrees. Turning it to the normal direction produced nothing. KC9RG reports a similar occurrence. On two occasions, he was able to hear stations to the west while pointed east, but unable to hear them on the direct path. One possibility for such a phenomenon is that reflection takes place off the edge of an E cloud. Does anyone have any other ideas?" Well, Bill, in Australia we refer to that as being backscatter, it being a rather common occurrence, particularly when the conditions are very good.

A new six metre country which has just appeared is called Aruba, being part of the Netherlands Antilles. The station concerned was P40JT (who was actually W6JKV) and he managed to work 216 different stations during a 10 day stay. There is also a local station, P43AS, who will be active using 100 watts and a seven-element beam.

Bill W3XO, also reports quite a few Es two metre openings across the country, particularly on 9/6, 19/6 and 30/6.

THE AUSTRALIAN SCENE ON SIX

WINTER

From the VK5LP viewpoint, I have sadly missed out on all the Winter time Es openings. Three commitments away from Meningie for nearly two weeks at a time makes a hole in on-air time, particularly when most occurred at peak opportunity time. I did manage to work some VK2s and VK4s on 22 and 23/7, but I was away for the good opening to ZL on 24/7 when, during the middle of the day (0300) ZL1, 2, and 3 were worked. Peter VK8ZLX, from Alice Springs, on a State visit to Col VK5RO, had a ball working the ZLs, again a case of being in the right place at the right time!

TWO METRES

It doesn't often happen, certainly I have never been involved, but Winter time Es on two metres between Adelaide and Brisbane is something of a rarity, but it did happen on Monday, July 25, when at 0435, Col VK5RO and Roger VK5NY worked John VK4KJL, on 144 102 MHz with signals to 5 x 9, with the band open for about 10 minutes. The distance is around 1600 kilometres. Col reported six metres had opened quite early, in fact at 2335, and remained open until at least 0630, during which time very strong signals were available from VK2, 3, 4, 6 and 7, with short skip evident from VK3. Bring old hands at the game, the VK5s naturally kept an ear on two metres whilst working on six metres, with the results the contact was made. Good work. I would not be game to say it has not been done before, but it is indeed an unusual happening, but I am quite sure similar conditions have existed in the past for such contacts to be made had there been someone at both ends at the right time.

Col VK5RO, has also been spending quite a deal of time on OSCAR 13 since it was launched, using mode B and JL, with good results.

NEWS FROM DAVID VK3AUU

David VK3AUU, has written to say that, during July and August on two metres, he worked the following interstate stations: VKs. 1AU, 1BG, 1BUC, 1VP, 2DVZ 2KWA, 2ZAB, 2ZRE and 7JG All contacts were on Saturday and Sunday mornings. VK1BG seems to have got on the list of stations who can be worked almost anytime.

David said two metres has been rather quite in the evenings, although one very interesting contact was with VK3KKW in Werribee, who was running SSB with 0.25 watts to an eight-element Yagi. three metres above ground His signal was 13 dB above noise for the distance of 105 kilometres over fairly flat unobstructed ground. That signal relates at -157 dBW or 0.1 uV. This agrees with the signal predicted by Bray (*QST* November 1961, pages 36 to 41). Would VK3ANY, VK3ANJ or VK3AFW care to comment?

On six metres, David has worked ZL on 21/7, 23/7 25/7 plus VK1, 3 and 5 on backscatter, and VK4 on Es on 25/7. Other good tropospheric conditions were noted on 11, 12 and 18/7

A further 10 stations have been worked by VK3AUU on EME, making a total of 32 stations in 16 countries. Best contact was PA0JMV, who runs two 17-element KLMs and a pair of 4CX250Bs, New countries were UG6, I, C3 and PA. He has continued to observe considerable enhancement of echoes at three degrees elevation. David says HF operators should note that this angle is obtained with the centre of the array at a height of five wavelengths.

Thanks for writing again David, always pleased to hear from you. Hopefully, when VK6LP gets into a more settled state, more contacts from Meningie will be available.

CLOSURE

These notes are being prepared a week or more ahead of time to allow me to have one more break! This time it is not associated with commitments, but to enjoy the company of four others when we make a 10 day trip which will include three days at Expo in Brisbane. We will be on a rather tight schedule, so there will be very little opportunity to meet any of the amateur fraternity, that is for another time! I regret any late notes which may need to be held over until next month

Closing with two thoughts for the month: *A lot of what passes for depression these days is nothing more than a body saying that it needs work*, and *As you go through life you are going to have many opportunities to keep your mouth shut. Take advantage of all of them!* 73. The Voice by the Lake.

SCHOOL LISTENING POST PROVIDES EDUCATION

A world history — social studies teacher at the Horace Mann School, Beverly Hills, California has motivated his students to explore their world through radio.

Craig Dible KB6LAK, decided three years ago to bring a shortwave radio receiver and his students began eavesdropping on the world.

"My kids can't believe the amount of activity that goes on outside the normal broadcast spectrum," Craig said.

He recognised the enormous potential that shortwave radio would have in his classroom. After obtaining a grant, the school's listening post was upgraded with an Icom R71A and Icom R7000 — fed with a trapped HF dipole and VHF/UHF Discone

Craig said he encourages students to listen to current events as they happen They heard, live, the ill-fated launch of the space shuttle *Challenger*, reports from both sides of the Iron Curtain on the Chernobyl nuclear plant disaster — and other news events.

The stimulus of listening to shortwave, and the VHF/UHF utilities, has resulted in at least half a dozen of the Seventh Grade pupils (aged about 12) to study and obtain their Novice licences.

Pupils at the Horace Mann School, California.

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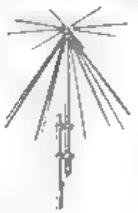

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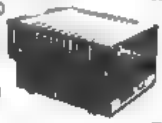

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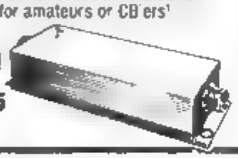

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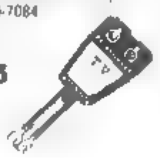

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How's DX?

MONTSERRAT DXPEDITION

A group of amateurs, Ron Marra AA5DX, Bill Carter KM5R and Alan Benoit WQ5W, will be operational from Montserrat in the CW WW DX CW Contest on the fourth weekend of November 1988. The call sign for the contest operation only will be VP2NW, however they will be quite active before and after the contest (from November 23 to November 29), using their reciprocal call signs; ie VP2M/AA5DX

Activity will be on all bands, 160 to 10 metres, on the normal DX frequencies.

QSLs for VP2MW only to KM5R, reciprocal contacts will go to the individual's call book address or via the bureau.

—Contributed by Ron Marra AA5DX via Ken McLachlan VK3AH

SOUTH AMERICA

Rick Dorsch NE8Z/HC1MD, will be active from San Cristobal Island in the Galapagos Islands from November 1 to 4, 1988, as either HC1MD/HC8 or HC8MD. Watch 25 kHz up from the bottom of each band on CW and all regular SSB DXpedition frequencies. QSL via John C Kroll K8LJG, 3528 Craig Drive, Flint, MI 48506. Please include an SASE or IRCs for a direct return.

On November 5, Rick will be operating as HC1MD from Quito.

Rick was also operational from Peru, October 14-22, as NE8Z/OA4, Ecuador from October 23-28 as HC1MD, in the CW WW Phone Contest as HD9OT from Ecuador, October 29-30, and using HC1MD/HC5 in Ecuador on October 31.

—Contributed by Rick Dorsch NE8Z/HC1MD via Ken McLachlan VK3AH

VISITOR MAY STAY!

Recently, well-known Pacific Island DXer, Raj Singh 3D2ER, from Suva, Fiji, visited Sydney and Melbourne for several weeks.

During his stay in Australia he used his recently issued call sign VK2FOI, operating from his brother, Vijay's home in the Sydney suburb of Engadine.

Raj, his wife Carol, and their children are hoping to emigrate to Australia in the near future.

—Contributed by Allan Williams VK2FH

From left: Raj 3D2ER, Stew VK2BFL and Allan VK2FH.

—Photograph courtesy Vijay Singh

ROTUMA

Rotuma is a small island group located in the western South Pacific Ocean and is part of the territory administer by Fiji.

A DXpedition is being mounted to Rotuma, from October 22, 1988 to November 5, 1988, by Eric Scace K3NA/VK9LT, Ed DeYoung VK8XX/3D2XX, Kip Edwards W6SZN, and Toni Zimmer KN3T/VK9NT

Two stations will be manned by the DXpedition with operations taking place on all HF amateur bands, both CW and SSB, around usual DX frequencies. Anticipated call sign will be 3D2XX, however attempts are being made to obtain a special prefix, as it is hoped that Rotuma may "fit-the-bill" for new DXCC country status.

—Contributed by Ed DeYoung VK8XX

HEARD AND WORKED IN WOODBINE during August

4S7RO (heard) — QSL via DJ9ZB.
K4DEX, JH7PFD, DL3BBV (heard), DK8MZ (heard), UZ0QWJ.
T32AB (heard) — QSL via N7YL.
A2J4XPO (heard) —This was a special call sign in Japan and the JRRL is to issue QSL cards for all contacts. The station was located in Central Japan.
HL9TF (heard), G4PEU/HH2 (heard — QSL home QTH), CO5RCD (heard), 4S7NS (heard), KT7I/KH2 (heard), VU2NR (heard)
YJ8AA (heard) — QSL via JH3DPH.
VQ9XF (heard) — QSL via NG7X.

—Contributed by Bob Demkiw VK2ENU

TUVALU AND BORA-BORA

Jim K8JRK, has just concluded a stint on Tuvalu (from October 28 to November 1) primarily for the CQ WW SSB Contest, and will now be operational from Bora-Bora as FO0SSJ, until late November.

QSL Jim to his home address, 801 South Oxford, Grosse Pointe Woods, Michigan, USA.

CASEY BASE STATION

Roman (Charlie) Cholawinskyj VK6MP, will be stationed at Casey Base, in the Antarctic, from December 1988 for a period of approx mately 13 months as Communications Officer for the Australian National Antarctic Research Expedition (ANARE). During his sojourn to the icy wastes, he hopes to be active on the amateur bands in his spare time using the call sign VK0MP

QSL Manager is Gil VK6AGC, via VK6RU, PO Box F319, Perth, WA.

—Contributed by Roman Cholawinskyj (Charlie) VK6MP

From left: Raj 3D2ER, Stew VK2BFL and Allan VK2FH

—Photograph courtesy Vijay Singh

From left: Bob Davison VK9ND, Sue Miller KA9UCK, and Dave Miller VK9LU/NZ9E, taken during Sue and Dave's recent trip to Norfolk Island.

DEADLINE FOR JANUARY IS NOVEMBER 7, 1988

WIA VIDEO TAPE PROGRAM TITLE LISTING as at August 27, 1988

John Ingham VK5KG
FEDERAL VIDEOTAPE CO-ORDINATOR
37 Second Avenue, Sefton Park, SA, 5083

Now *every* radio club can provide their members with quality technical lectures on subjects covering the whole range of amateur radio activities by taking advantage of the WIA Federal Videotape Library. You will find this a boon, particularly if yours is a country club which often has difficulty obtaining a variety of expert lecturers for regular meetings. (Individual amateurs and librarians should take note of the new Duplication Fees at the end of this article.)

For radio clubs affiliated with the WIA, it is inexpensive and easy. Here is how it works.

Except for those titles for which the WIA does **not** hold a copyright licence, all you have to do is . . .

Supply the Videotape Co-ordinator with a videocassette in a Video Cassette Box "Postpak", and Enclose address and stamps for return postage.

and the program is free for you to use in support of amateur radio in your area . . including copying and transmission over the air if you wish.

Those programs which are copyright are available only *on loan*. To obtain any of them send with your request .

Information about your preferred VCR format
A statement signed by a responsible officer of your club that "I undertake that while (Program Title) is assigned to me, I will not allow it to be transmitted over the air, nor copied by any means whatsoever, and that I will return the same promptly after showing"
Enclose Address and stamps for postage to you.

The present available formats are as follows . .

U-MATIC:
Size 260 x 173 x 40 mm, mass 900 grams (to institutions only).
Standard play — one hour maximum only.
Standard sound only on channel 2 (No Dolby).

VHS:
Size 200 x 110 x 30 mm, mass 350 grams.
* Standard play four hours maximum, or long play eight hours maximum as requested.
* Standard Sound — Dolby On or Off as requested.
Hi-Fi FM Sound also present on all VHS cassettes.

BETA:
Size 160 x 100 30 mm, mass 300 grams.
Standard play three and a quarter hours maximum only.
Standard sound only (No Dolby).

VIDEO 8:
Size 103 x 68 x 20 mm, mass 80 grams.
* Standard play one and a half hours maximum, or long play three hours maximum as requested.
Hi-Fi FM sound is standard (No Dolby).

Obviously, the smaller and lighter the cassette, the less postage.

* NOTE. Be sure to request *Standard* or *Long Play*, *Dolby On* or *Off*.

NOTE TO INDIVIDUAL AMATEURS

Since the inception of the WIA Federal Video Service, cassettes have been made freely available to all comers, especially isolated amateurs. However, recently there has been a rapid rise in the number of requests from individual amateurs, some asking for over 10 hours of programs at one time.

Video duplication is a real-time, one-at-a-time operation for which the costs of maintenance of the equipment is not small. Obviously, the Service is much more economical if, say, one tape is seen by 30 members of a club than if each of the 30 members were to request their own personal copy. If *every* member of the WIA requested just *one* program, it would take about four years at 40 hours a week to service!

So, in an effort to encourage requests from groups of amateurs rather than individuals, from now-on a Duplication Fee of $2 per hour, or part thereof, will be payable in advance for all requests from individuals. All such fees will go towards upkeep of the duplication equipment.

NOTE TO LIBRARIANS

A number of educational institutions have already availed themselves of the technical lecture tapes from the WIA. While this service will continue to be available, from now-on a Duplication Fee of $10 per hour, or part thereof, will be payable in advance by all institutions not affiliated with the WIA. All such fees will go towards the production costs of future Technical Lectures.

NOTE RE TAPE CASSETTE QUALITY

The WIA Videotape Co-ordinator retains the right to refuse to copy onto inferior quality video tape. In the past such tape has caused many hours of wasted time through clogged video heads, and in future only reputable brands of video tape will be accepted. In particular, although not always in itself a guarantee of quality, use only those VHS cassettes which carry the official "VHS" logo.

SEE NOTE	TITLE (in chronological order within each subject grouping)	LECTURER	PROD	APPROX TIME in MINS	COL / B&W	YEAR PROD (19..)	DESCRIPTION & OTHER INFORMATION
GENERAL PROMOTIONAL FILMS							
—	The Ham's Wide World		ARRL	30	Colour	69	*Superseded by "The World of Amateur Radio"*
—	This is Amateur Radio		ARRL	15	Colour	70	*Pitched at Teenagers*
—	Moving up to Amateur Radio		ARRL	15	Colour	75	*Pitched at CBers*
©	7J1RL DXpedition		JARL	60	Colour	76	*General Amateur Radio Interest: LOAN ONLY*
—	This Week Has Seven Days looks into Amateur Radio		H5V7	25	Colour	78	*Pitched at Teenagers includes some ARRL footage*
—	Amateur Radio — The National Resource of Every Nation		VK5KG	6	Colour	79	*Encapsulates AR good for public exhibition*
—	The New World of Amateur Radio		ARRL	30	Colour	82	*Pitched at Adult Level*
HISTORIC INTEREST							
©	Wireless Telegraphy — circa 1910		?	10	B&W	10	*Archive Material courtesy David Wardlaw VK3ADW*
©	Amateur Radio (TV Pilot Program)		WIA NSW	30	B&W	60	*Archive Material courtesy TEN Channel 10*
—	Opening of Barley Griffen Building — SA HQ		VK5KG	50	Colour	77	*Archive Material*
—	History of ATV in South Australia		VK5KG	30	Colour	80	*Archive Material, still building*
—	ATV in Australia 1978 — made for British ATV Club		VK5KG	30	Colour	78	*Archive Material*
—	ATV in United Kingdom 1978 · reply from BATC		G8CJS	30	Colour	78	*Archive Material*
—	Port Macquarie Field Day — 1983		VK2BFM	25	Colour	83	*Archive Material*
—	VK2 75th Anniversary Seminar Keynote Speeches		WIA NSW	135	Colour	83	*Dr David Wardlaw & State Manager DOC*
©	Heard Island DXpeditions		Ch 2, 7, 9 & 10	20	Colour	84	*Archive Material No Loan or Copy Available*
—	Opening of Amateur Radio House — NSW HQ	VK2BCC VK2DCC	WIA NSW	60 102	Colour	86	*Raw Unedited, from 1986 VK2 Seminar*
ANTENNAS AND PROPAGATION							
©	G6CJ's Aerial Circus	G6CJ	WIA	90	B&W	77	*The Definitive Antenna Lecture Loan Only*
—	Wire Antennas	VK5RG	VK5KG	40	B&W	78	*Antennas for HF and Antenna Tuners*
—	Loaded Wire Antennas	VK5NN	VK5KG	50	Colour	80	*Using Inductive and Capacity Loaded Antennas*
—	Getting Started in Understanding the Ionosphere	VK5NX	VK5ZBD	50	Colour	83	*How the Ionosphere Aids HF Communication*
—	VHF Signal Enhancement by Aircraft	VK2ZAB	WIA NSW	70	Colour	86	*Raw Unedited, from 1986 VK2 Seminar*
—	Antennas and Directivity	VK2BBF	OTC	73	Colour	85	*Lecture given to a group of radio amateurs*
—	Antenna Rotator Systems	VK5AIM	VK5KG	50	Colour	86	*Servicing the several different types*
—	Broadband Antennas	VK5RG	VK5KG	62	Colour	86	*Includes terminated antennas*

SPACE — GENERAL INTEREST							
—	Apollo 13 Disaster	VK5JM	VK5KG	60	Colour	86	*Australian Tracking Procedure Saved Apollo 13*
—	SSTV Pictures from Space — Voyager		VK5KG	15	Colour	83	*SSTV Pictures Converted from Saturn Fly-Past*
—	AUSSAT — Australia's Domestic Communications Satellite	VK5JM	VK5KG	62	Colour	84	*Technical Description of Services Offered*
—	Amateur Radio's Newest Frontier		ARRL	26	Colour	85	*Amateur Radio in Space, General PR*
—	Working W5LFL in Orbit from VK10RR		Richard Elliot	23	Colour	86	*Raw Unedited Actuality Footage*
AMATEUR SATELLITES							
—	Getting Started in Amateur Satellites	VK5HI & VK5AGR	VK5KG	60	Colour	83	*Superseded (see below)*
—	An Introduction to Amateur Satellites (Part 1)	VK5AGR	VK5KG	60	Colour	84	*An Overview of Amateur Satellite Operation*
—	Micro-Computer Aids to Satellite Tracking (Part 2)	VK5AGR	VK5KG	30	Colour	84	*Programs for Tracking and Decoding Telemetry*
—	Using Phase 3 Amateur Satellites	VK5HI	VK5KG	90	Colour	84	*History, Construction and Use of High Orbit Satellites*
—	The AMSAT OSCAR Phase 3 Story	DJ4ZC	VK5KG	60	Colour	85	*"The Father of OSCAR" includes film of the Launch*
—	Antennas for Satellites	Dr Trevor Bird	WIA NSW	75	Colour	86	*Raw Unedited from 1986 VK2 Seminar*
[illegible]							
—	Getting Started in Amateur RTTY	VK5JM	VK5KG	85	Colour	83	*RTTY using Teleprinters and Micro-Computers*
—	Amateur Packet Radio	VK5AGR	VK5KG	60	Colour	84	*Theory and Demonstration*
—	Packet Radio — 18 months on	VK2KYJ & VK2AAB	WIA NSW	65	Colour	85	*Raw Unedited from 1986 75th Anniversary VK2 Seminar*
* *	X.25 Protocols and Packet Switching	VK2ZXB	OTC	47		86	*Lecture given to a group of radio amateurs*
AMATEUR COMPUTERS							
—	Demonstration of VK5RTVs Micro-Computer Controller # 1	VK5KG	VK5KG	10	Colour	81	*First Micro-Computer Controlled Repeater in Australia*
—	Understanding Micro-Processors	VK5PE	VK5KG	60	Colour	[illegible]	*A Somewhat Dated Technical Description*
—	An ATV Ham Shack Micro-Computer	VK3AHJ	VK3AHJ	10	Colour	81	*Describes now unavailable Micro-Computer Kit*
—	Getting Started in Amateur Micro-Computers	VK5IF	VK5KG	33	Colour	[illegible]	*Demonstration of Hard and Software for Amateur Radio*
AMATEUR TELEVISION: [illegible]							
—	The Signal to Noise Story	VK3ATY	VK3AHJ	45	Colour	82	*Superseded by "UHF Preamplifiers" (see below)*
—	UHF Preamplifiers	VK3ATY	VK3AHJ	45	Colour	83	*Explanation and Demonstration of Low Noise Preamplifiers*
—	Getting Started in Amateur Television	VK5KTV	VK5KG	55	Colour	83	*How to Set-Up an Amateur Television Station*
—	Testing Amateur Television Transmitters	VK5KG	VK5KG	50	Colour	83	*How to Correctly Measure Amateur Television Systems*
*	High Definition Television Tutorial	Don Fink	WB2LLB	60	B&W	83	*A Look at What is to Come in Broadcast Television*
*	ATV Hamfest, York Pennsylvania, September 1983	Various	WB2LLB	300	Colour	83	*Various ATV Technical Lectures from USA*
AMATEUR TELEVISION: Activity							
—	ATV in Australia 1980/81 — Made for British ATV Club		VK5KG	60	Colour	81	*Clips from ATV Groups in VKs 2, 3, 4, 5, and 7*
—	ATV in United Kingdom 1978/81		G8CJS	30	Colour	81	*Remake of their Previous Effort*
*	CQ ATV DX International 1983		WB2LLB	60	Colour	83	*ATV in USA and Europe*
	ATV in Victoria, 1984		VK3AHJ	84	Colour	84	*Courtesy of "The Roadshow Gang"*
‡	Hello from America! — Made for British ATV Club		W90OCO	100	Colour	85	*Clips from ATV Groups in the USA.*
AMATEUR TELEVISION: [illegible]							
—	Low Definition Television	Chris Long	VK5KG	25	Colour	82	*Recreation of Television as Transmitted by Baird*
—	Model Aeronautical Mobile ATV	VK5GD	VK5KG	6	Colour	83	*Amateur Television Camera and Transmitter Mounted in a Model Aeroplane*
—	VK5RCN — Australia's First Wind Powered ATV Repeater	VK5KAU	VK5KG	61	Colour	86	*A Tour In and Around VK5RCN*
‡	Australian TV History — The Untold Story	Chris Long	VK5KG	55	Colour	88	*Lecture to Radio Amateurs Old Timers Club*
‡	Australian TV History — Part 2	Chris Long	VK5KG	40	Colour	88	*Technical slides not used in the above*
MISCELLANEOUS							
—	An Auxiliary Battery Charger	VK5NK	VK5KG	20	Colour	81	*Charging a Second Mobile Battery*
—	Lecture — Winning Fox Hunts	VK5TV	VK5KG	45	Colour	81	*How to do it from one who has!*
—	Getting Started in Amateur Construction	VK5ABA	VK5KG	50	Colour	83	*Mechanical Hints for Novice Constructors*
—	Communication Consequences of Nuclear War	Dr John Coulter	VK5ZBD	60	Colour	83	*Why Your Gear May Not Survive, Even if You Do*
—	The Far Eastern Broadcasting Company		VK5KG	55	Colour	84	*How a Shortwave Broadcaster Operates*
—	The Australian "Over the Horizon Radar"	Dr Paul Whitham	VK5KG	60	Colour	84	*How the "Australian Woodpecker" Works*
—	What to Expect When the Radio Inspector Calls	Geof Carter DOC	VK5KG	34	Colour	84	*Geof is a Department of Communications Field Officer*
—	Doppler Direction Finding for Fox Hunters	VK2BYY	WIA NSW	43	Colour	85	*Raw Unedited from 75th Anniversary VK2 Seminar*
* *	Fitting BNC Connectors		OTC	7	Colour	86	*Correct Assembly of Crimp Type BNC Plugs*
* *	Handling Static Sensitive PCBs	Paul Tardent	OTC	6	Colour	86	*Improving Reliability of Printed Circuits*
—	Extra License Grades	VK2ZTB	WIA NSW	70	Colour	86	*Raw Unedited: from 1986 VK2 Seminar*
‡	Tiwick Film Modules	VK5DI	VK5KG	45	Colour	88	*Description of modules available from VK5WIA.*
‡	Where should the WIA be Heading?	WIA Fed Pres	VK5KG	50	Colour	88	*Lecture given by Peter Gamble at VK5 WIA.*

NOTE

denotes Copyright no copy service

‡ denotes New Addition

** denotes Optically Converted to PAL from NTSC by WB2LLB — noticeable flicker*

** * denotes available only to Radio Clubs affiliated with the WIA as per agreement with OTC*

Standard Formats. Beta, Video 8 St & L Play, Dolby and Hi Fi sound — please specify when ordering

Intruder Watch

Bill Martin VK2COP
FEDERAL INTRUDER WATCH CO-ORDINATOR
33 Somerville Road, Hornsby Heights, NSW. 2077

Those people who have been following the saga of the recalcitrant transceiver can now relax. I have the rig back and it is working well. Dare I mention that, on receipt of the rig, my almost-new RTTY equipment is now semi-defunct!

Keep reading the column for further gripping episodes of the unexpected!

Statistics for August are as follows:

1050 AM intrusions reported (mostly Asian 28 MHz intruders)

151 CW intrusions (the usual USSR and Vietnam nuisances)

272 intruders were using RTTY

206 other were using different modes of emission

31 intruders identified themselves on air.

Many thanks to the following people for helping out:

VK2EYI.

VK4s — ADY, AKX, BG, BHJ, BTW, BXC, IS, KHZ, OD, YD.

VK5s — GZ, TL.

VK6RO.

VK8s — HA, JF

DOTC has advised me that they are investigating a large carrier which has been sitting on 14.000 for some time. I fear that it comes from within VK, and is being heard S9 in New Zealand. The IARU Region 3 Conference was held in Seoul, Korea, last month, and the Monitoring System (Intruder Watch) was ably represented by Bob Knowles ZL1BAD, the IARU International Monitoring system co-ordinator. We hope that some good came from the conference as far as the IW is concerned.

So, that is about the story for the moment. will see you next month, for the last time! (More about that later). Take care, and 73 for now.

Contests

Frank Beech VK7BC
FEDERAL CONTEST MANAGER
37 Nobelius Drive, Legana, Tas. 7277

CONTEST CALENDAR

NOVEMBER 1988

11 — 13 Japan International DX Contest (Rules August issue)
12 — 13 European RTTY Contest
12 — 13 OK DX Contest Phone and CW (Rules September issue)
— 12 ALARA YL/YL Contest
— 13 BATC SSTV/FSTV Contest
26 — 27 CQ WW DX CW Contest

DECEMBER 1988

— 24 Commencement of the WIA Ross Hull Memorial VHF/UHF Contest (Rules this issue)

January 1989

— 7 Conclusion of the WIA Ross Hull Memorial VHF/UHF Contest (Rules this issue)

ALARA

A note from the Australian Ladies Amateur Radio Association should provide an additional incentive to participate in this 1988 contest which is to be held on November 12. To celebrate the Bicentennial, the following conditions will gain for participants a special award certificate:

For VK YLs and OMs — obtain 200 points including 10 ALARA members.
For DX YLs and OMs — obtain 88 points including five Alara members.

RESULTS OF THE 28th (1987) ALL ASIAN DX CONTEST CW SECTION

Australian scores
— Single band entry.

VK4TT	14 MHz	14916 points*
VK4XA	21 MHz	28980 points*
VK2DID	21 MHz	2535 points
VK2AIC	21 MHz	1452 points

— Multiband entry.

VK5AGX	28000 points*
VK2BQQ	26160 points
VK8AV	26105 points
VK5SW	616 points

— New Zealand entry.

ZL1AIH	3.5 MHz	330 points*
ZL1HV	21 MHz	4998 points*

* Denotes Certificate Winner.

The total number of entries for this contest according to JARL was 1129, It is interesting to note that only three entries, one for more than two percent duplications, one for multi-classified entry and one for after deadline, have been disqualified.

RESULTS OF THE 28th (1987) ALL ASIAN DX CONTEST PHONE SECTION

Australian and New Zealand Entries
Single band entry.

VK2XT	21 MHz	49536 points*
VK2PFQ	28 MHz	20 points*
ZL1BWM	21 MHz	15980 points*

— Multiband entry.

VK2APK	52500 points*
ZL1IM	2223 points*

* Denotes Certificate Winner.

In the phone section of the contest, 13 log have been disqualified, eight of these because of missing the deadline. The phone section attracted 794 entries. From the results, it would appear that the CW operators, with 1129 logs, had only two disqualified for operational errors, whereas in the phone section containing 794 entries, some five logs were disqualified.

RESULTS OF WIA 1988 NOVICE CONTEST

There were 35 entries received for this year's contest and the standard of logs presented, apart from one or two, was very good. Unfortunately, six stations had their entries disqualified, in each case because of incorrect reports being logged or duplicate contacts unrecorded. Please take more care next year.

Section A Novice Winner VK5NOD 628 points
Section A AOCP Winner VK3AJU 683 points
Section B Novice Winner VK1NAS 117 points
Section B AOCP Winner VK8AV 77 points

The Keith Howard VK2AKX Trophy will be awarded this year to VK5NOD for the highest aggregate score.

Individual Scores, Section A, Phone

VK3AJU	683	VK3YH	389	VK4KJD	110
VK5NOD	628	VK5GV	68		
ZL3KR	612	VK6NSH	217	VK4AVR	53
VK2NAN	602	VK8AV	203	VK4IS	45
VK5QX	529	VK6APK	202	AX3XB	30
VK3PTB	453	VK1NAS	216	AX3KS	20
VK4NEF	487	VK7NBC	182	ZL1IM	129
VK2LEE	437	VK3CWT	171	VK6NSH	217
VK4MWZ	322	VK3ZI	146		

Individual Scores, Section B, CW

VK1NAS	117	VK2AZR	37
VK6NAZ	79	VK4NEF	36
VK4MWZ	79	AX3KS	14
VK8AV	77	VK5NOD	51

Westlakes ARC station — VK2ATZ 351 points.
Check log — VK4TT.

Entries from six stations did not comply with the rules of the contest, or had their scores reduced by a figure in excess of that allowed for within the contest disqualification criteria as laid down from time to time in *Amateur Radio*.

Additional Certificates for the contest, issued to the highest novice score for each State not covered by a National Winner.

VK1NAS
VK2ATZ
VK2NAN
VK3PTB
VK3AJU
VK4NEF
VK5NOD
VK6NSH
VK8AV
VK7NBC

Insufficient entries from novice stations in the CW section have resulted in no certificates being issued on a call area basis for this contest.

The number of entries received this year was down again, I have a feeling that it is due to the reduced rate of novice newcomers to the hobby, plus the rather poor conditions on 10 metres, and the winning certificates not being issued on a State by State basis could have a bearing on the resultant decline in this contest.

Now for some comments that accompanied the entries.

Thanks for the contest, most enjoyable and very pleased to work the lower power stations, especially the VK6 and P29s . . ZL1IM.

A most enjoyable contest again this year. Pity that 28 MHz was dead . . ZL3KR.

I would expect two metres to be included in the rules for 1989. Perhaps on a one hour between contacts basis like the RD Contest used to be. VK4AVR

Many thanks for the Novice Contest. I enjoyed it although it seemed to be a little dull. Almost all operators were very pleasant and friendly which seemed to help the time pass. CW contacts were a little thin although the standard was excellent. All in all, a good contest. Possible changes — repeat contacts after two hours. VK4MWZ.

A very enjoyable contest. Pity 10 metres wasn't open. Next year propagation may be better. See you then. VK6APK

I enjoyed the 1988 VK Novice Contest quite a lot, even though I spent 15 to 20 minutes trying to get my call sign across to VK2, 3, 4, etc. Had a bad antenna — an end fed quarter wave. I hope you enjoyed checking my log and I hope to participate in the contest next year. James McBride VK6NFJ, aged 13 years.

Thanks for running the contest which seemed to be fairly well patronised. I did perceive a lack of club stations however. Whilst not joining in the CW section, I also noted a very poor showing by stations in this section. Ian VK5QX. Yes Ian. I will be writing to you shortly. FCM

Sample Participation Certificate.

RULES FOR THE 1988 ROSS HULL MEMORIAL VHF/UHF CONTEST

Objects: Australian amateurs will endeavour to contact as many other amateurs as possible using the contest bands.

Period: From 0001 UTC, December 24, 1988 until 2359 UTC, January 7, 1989 (fourth Saturday of December until first Saturday of January 1989).

Bands: 52, 144 and 432 MHz.

Modes: SSB, CW, FM

No terrestrial repeaters are to be used for scoring.

No cross-band contacts *unless* via an orbiting satellite.

Satellite contacts permitted if the *uplink* is in the contest band.

Contacts within ones own *Maidenhead Locator Square* will not count.

CONTEST EXCHANGE: Report, serial number and Maidenhead Locator Square cipher. (The serial number will commence with 01 and increase by one for each QSO until 99 is reached, when the number returns to 01 again) each UTC day. Note that only four character level of locator system is used; ie QE38, PH57, RG30, etc.

Score. One point per contact, per band, per UTC day.

Total Score: The total score will equal the number of valid contacts, plus 50 times the number of different locator squares worked, irrespective of bands.

Operator: Single operator only. One transmission only at one time.

Log Sheets: The following data is must be shown: Date and Time in UTC, Band used, Mode, Station Worked, Report Sent, Serial Number, Locator Square, Report Received, Serial Number Received, Locator Square Received.

Cover Sheet — Operator's name and call sign, address and a signed statement that the station has been operated within the contest and licence rules and spirit of the contest.

Overseas Stations: Rules similar to those for Australian stations.

Awards — Certificates will be awarded to the highest scoring station in each Maidenhead Locator Field. The locator Fields will also be used to determine the winners outside Australia.

A perpetual trophy is awarded annually for competition between members of the Wireless Institute of Australia. The winners name is engraved on the trophy and the winner also receives a suitable certificate.

The entrant with the highest overall score for the contest will be the winner and their Division will hold the trophy for one year.

Participation Certificates: Indicate on the entry sheet and enclose a SASE (At least 180 x 150 mm) if a participation certificate is required.

Entries: Cover sheet and your total score set out to show the number of points claimed throughout the contest, plus 50 times the number of different locator squares worked. NOTE. For the purpose of this contest a separate log for each band is not necessary.

Post your Entry to: The Federal Contest Manager, C F Beech VK7BC, 37 Nobelius Drive, Legana, Tas. 7277. Entries must be postmarked no later than February 1, 1989.

For those amateurs who are unfamiliar with the Maidenhead Locator System, the data on how to find the locator square that you operate from may be found in my contest column of November 1987. The NZART Call Book contains more detail and the WIA Divisional Bookshops should stock the *Radio Amateurs World Atlas* containing all 32400 Maidenhead Locator Squares in the world.

It should be noted further that the contest is open to all licenced amateurs whether or not they are members of the WIA.

Last year, I became aware that a number of amateurs thought that this contest was for members of the WIA only. I do not know how this occurred as the rules, as printed, are quite specific.

The Trophy is held by the State Divisional of the WIA irrespective of the allegiance of the owner of the winning call sign, and due to the geographical location of the Maidenhead Locator Fields, it is quite possible that the trophy will reside in a State with a different prefix than that used by the winning entry.

PLEASE DO NOT CONFUSE MAIDENHEAD LOCATOR SQUARES WITH *FIELDS*.

VHF FIELD DAY 1989

A VHF/UHF National Field Day Contest will be arranged for a weekend early in the new year. More details will follow next month when the dates have been finalised, the contest will be held over a 24-hour period. VHF/UHF only with the emphasis on portable field day style operation both single operator and club efforts.

The rules will not be complicated, will embrace the locator square system, and, if the response is satisfactory, could perhaps replace the controversial VHF section of the John Moyle Memorial Field Day Contest.

LETTERS

I have received a number of letters over the past few months complaining about the rule changes that I have made to some contests. The main complaint is that I have reintroduced the requirement for contesting stations to exchange signal reports!

Some of the suggested reasons that I have used are quite colourful, however I will keep my comments to those of a more serious nature. It has been stated that the exchange of a signal report is irrelevant to the contest as all signal reports are either 5 x 9 or 599. Are they? Well, don't be too sure! It has also been stated that the report is basically meaningless in most contests. Perhaps, but it is a numerical exchange that is required by almost all radio contests world-wide and only a very few use another figure such as the operator's age or number of years "on the air".

Another complaint was that I have caused a lot of contesters to modify the sacred computer program that will only accept so many characters per line. This is something that I must admit was not taken into consideration when the decision was taken to reintroduce the requirement. However, as the vast majority of amateurs do not own computers, I think that the programs could be modified by the operators.

Two amateurs who obviously had a good old *rag-chew* before writing to me both state that the Regulatory Authority does not require us to exchange signal reports. This is so, but ever since amateur radio began in the early days, signal reports have been exchanged as a matter of course. It would seem to me that to drop the requirement is to really make the exchange totally meaningless.

Many of the amateurs who enter the WIA sponsored contests also spend a great deal of time and effort in the many and various contests that are held world-wide and I would like to think that they do not complain to the organisers of these overseas events!

"Exchanging signal reports only confuses the issue" was a comment by one amateur. I must apologise for making the contest too difficult, however, please try a little harder next year, you will get used to it!

The multi-station operator rule has been introduced to eliminate a distortion that creeps into the compilation of the results of the Remembrance Day Contest. The results become distorted when the formula, which was introduced by a previous contest manager, included a participation factor. Despite this, one amateur has entered seven logs for the 1988 RD Contest. These seven logs are for four stations operating at two addresses, three different VHF stations and three different HF stations on the air from the same address. Yet, the operator who signed the logs has entered a contest log for another station at a different address some kilometres away. This, you can see, has distorted the participation factor. If the method of determining the winning State is to remain as it is, then the distortions must be removed.

I have also received some flak from the same sources for allowing CW entrants to claim double points for the contacts in the RD Contest. This has been done to try and encourage the use of this mode of transmission for two reasons. One, it requires more skill and should therefore be encouraged. Two, to endeavour to increase the number of participants using this mode.

Most of those who complained about the changes suggested that the contest should be made easier, but if they are too easy, they become worthless and offer no training at all!

The Remembrance Day logs are coming in steadily with 246 received so far (September 1, 1988). All are well presented and all sections, apart from the SWL section, are represented. Please make the effort to join in the Ross Hull Memorial Contest next month, the ZL operators will be looking for you with more interest this year.

HF CONTEST CHAMPIONSHIP — 1987 RESULTS

Having received the results of the 1987 VK/ZL Oceania Contest, I am now able to announce the results of the 1987 HF Contest Championship Competition.

PHONE SECTION

CALL SIGN	JMFD	RD	NOV	VK/ZL	PTS
VK1RJ	0	7	0	10	17
VK1RH	0	1	0	8	9
VK2BQS	0	0	5	1	6
VK3YH	10	9	9	9	37
VK3AJU	9	8	10	0	27
VK4NEF	0	0	9	9	18
VK5QX*	10	10	10	10	40

Insufficient entries VK6 — VK7 — VK8 — VK9

CW SECTION

Insufficient entries. VK1 — VK2

VK3CQ*	10	10	10	10	40
VK3XB	0	5	2	9	16

Insufficient entries. VK4 — VK5 — VK6 — VK7 — VK8 — VK9

Congratulations and a trophy go to Ian Hunt VK5QX and Gil Griffiths VK3CQ, for the perfect scores, and being the trophy winners for 1987.

IAN VK5QX

Gil VK3CQ.

NATIONAL SPRINTS

The Third National Sprint, jointly sponsored by the Adelaide Hills Amateur Radio Society, and the South Australian Division of the Wireless Institute of Australia, was again enjoyed by VK, P29 and ZL amateurs during July 1988.

The sponsors, in their continuing endeavours to improve this "quickie" contest, have looked at the name "National Sprint" and consider that this does not fully indicate inclusion of P29 and ZL amateur operators, although the rules, as published, invite interaction of P29, ZL and VK operators.

Consequently, to be effective at the next timing of this contest, currently July 1989, the contest will be known as the Australasian Sprint.

In assuming this name, it is felt that amateurs both inside and particularly outside Australia who have a personal objection to the word National, may sense a bond between the three countries in the New name, and thereby the contest may find wider acceptance in future years.

It is understood that there is a move in VK4 and VK7 to run Sprints of this nature and, while it is flattering to think that the idea, which had its birth at the Adelaide Hills Amateur Radio Society, is held in sufficiently good stead by VK4 and VK7 to instigate their own contests under Sprint conditions, the Adelaide Hills Amateur Radio Society wishes them well but move to ensure that his Sprint Contest is maintained as the original Australasian Sprint embracing P29, ZL and VK operators

—Contributed by Gordon Welsh VK5KGS Secretary, Adelaide Hills Amateur Radio Society Inc

1988 JACK FILES SUNSHINE STATE MEMORIAL CONTEST RESULTS

The WIAQ Contest Manager, Ted Mulholland VK4AEM, reports

SECTION 1(a) TRANSMITTING ALL BANDS

CALL	PTS	CALL	PTS
VK4VR	1703	VK4NMA	1363
VK4BRG	1235	VK4ACC	738
VK4MWZ	479	VK4NFE	417
VK4QI	380	VK4MAU	345

SECTION 1(b) TRANSMITTING HF ONLY

VK4LT	1442	VK4NLV	1442
VK4AQD	784	VK4FNE	754
VK4IS	510	VK4SF	419
VK4KEL	392	VK4LOW	392
VK4CAG	342	VK4BRZ	282
VK4PJ	251	VK4XX‡	224
VK4RM	217	VK4KB	120
VK4JCS	91		

SECTION 1(c) TRANSMITTING UHF/VHF ONLY

VK4YPB*	651

SECTION 1(d) CLUB STATIONS

VK4RC	1402	VK4WIE	1221
VK4WIS	1105	VK4WIM	1096
VK4WIR	1056	VK4WIX	1015
VK4BPA	982	VK4WIG	904
VK4WIZ	783	VK4WIN	846

SECTION 2 OUTSIDE VK STATIONS

ZL3KR	760	AX3PJB	374
VK7KC	340	AX3XB	294
AX3KS	150	VK3CFI	118

CHECK LOGS

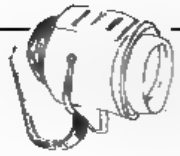
VK4s RX, XW, OD BAW and ZML/P

‡ denotes Solar Power

* As only one entry was received in the VHF/UHF Section, it is recommended no trophy but a Certificate of Commendation be awarded instead.

Congratulations to the winners and participants. NOTE Where were the VK2 logs? Quite a few points were given to VK2 stations!

—Contributed by John Aarsse VK4QA VK4 Divisional Secretary



Spotlight on SWLing

Robin Harwood VK7RH
52 Connaught Crescent, West Launceston, Tas. 7250

Well, conditions on the higher frequencies have made a dramatic improvement during Spring. The 16-metre broadcasting allocation has proved particularly interesting in out late afternoons, with many European signals coming over the Long Path. In fact, it is getting rather crowded down there, as more international broadcasters seek to take advantage of the very improved propagation.

The 13-metre allocation is slowly picking up and I do expect that more stations will take advantage of these frequencies very rapidly. I have also noted that, at least, one broadcaster has made it back to the 11-metre allocation an that is Radio Denmark on 25.655 MHz at 1200 UTC. I do expect that the few broadcasters such as the BBC, Radio France International, VOA and Swiss Radio International, who have been some of the very few to utilise this very high allocation could return very soon.

Recently, important reorganisation of the broadcasting structure of Radio New Zealand was announced. The two networks, National and Commercial, were going to be made into separate entities, with the latter being responsible for their own financing. As well, the external service of Radio New Zealand was going to come under the Ministry of Foreign Affairs, who would fund the service and RNZ are likely to produce programming under contract to the MFA. The antique 7.5 kW senders will be retired and a more realistic sender acquired along with a new transmitting site, possibly on the east coast of the North Island. Target date for commencement of the new service is the middle of next year.

Recent speculation that the VOA was going to decommission the Bethany, Ohio site, has been refuted by a VOA executive. There are no plans to take the site out of service, despite the closure of the AFRTS Network on shortwave at the end of September. It will continue with VOA and probably BBC programming into Latin America. Also, there has been no word yet when Radio Australia's Pacific Island service from near Townsville is to commence. I've heard of a mid-October date but time will tell. RA is going to use three 10 kW senders formerly located at Lyndhurst, Victoria.

And, while Lyndhurst is on my mind, many of us well remember VNG, the standard frequency and time station operated by Telecom, which abruptly went QRT on September 30, 1987. A private consortium of VNG users was formed late last year to reactivate VNG. They were indeed fortunate in obtaining the three 10 kW senders that were formerly at Lyndhurst and also a site was found at Llandino, New South Wales, which has been used as the main aviation HF transmitting site for many years. In early August, VNG came back briefly on the air on 4.500 MHz for test transmissions. Unfortunately, the senders had to be shut down as they were causing severe interference to other HF spectrum users, particularly around Sydney and Tasmania. It apparently was an antenna mismatch and the feedline has to be altered to the HF dipoles at Llandino, as well as the senders checked for spurious emissions before VNG will again be heard on 4.5, 7.5 and 12 MHz.

Another new station has appeared on 9.765 MHz at 0600 UTC with the call sign of the *Voice of the Mediterranean!*

It is located in Malta and is a joint operation of the Maltese and the Libyans. From 0600 to 0700 UTC it is English and the last hour is in Arabic. Signals here in Launceston are quite clear. They are apparently using the Cyclops site that has carried DW programming for many years. A MW channel is announced as broadcasting simultaneously. The station also is on from 1400 to 1600 UTC on 11.925 MHz. The address given is PO Box 143, Valetta, Malta. This used to be the address of English transmissions of the Voice of Libya.

For those interested, there are some amateur nets with SWL and DX updates, where information and loggings are exchanged. There is a weekly sched at 0600 UTC on 7.110 MHz +/- QRM on Tuesdays. Also, on the second Saturday of the month, DXers in New South Wales are linked up also on 7.110 MHz at 0500 UTC.

That is all for this month. Until December, the very best of DXing and good listening. —Robin VK7RH

ar

MORSEWORD 21

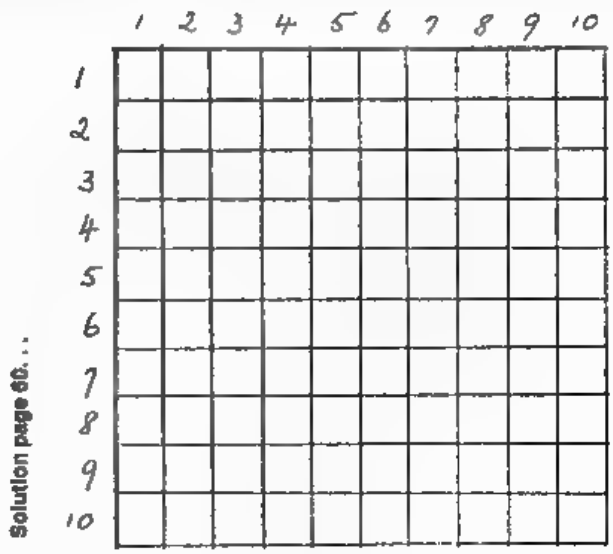
Audrey Ryan
30 Starling Street, Montmorency, Vic. 3094

ACROSS

1. Sign of infection
2. Beginning
3. Lease
4. Howl
5. Used with a hammer
6. Expression of disgust
7. Fat cat's initials!
8. Brand of petrol
9. Hurries
10. Consumer

DOWN

1. Part of a church
2. Mode of address
3. A blast
4. Sheep
5. Layers
6. Contends
7. Ocean movements
8. Egg on
9. Performance
10. Very dry



Solution page 60...

Australian Ladies Amateur Radio Association

Joy Collis VK2EBX
PUBLICITY OFFICER, ALARA
Box 22, Yeoval, NSW 2868

ALARA CONTEST

The ALARA Contest will be held on Saturday, November 12, from 0001 to 2359 UTC, this year.

As well as the usual certificates, special Bicentennial certificates may be gained as set out in last months *Amateur Radio*, and the Florence McKenzie Trophy will once more be awarded to the novice YL (not necessarily an ALARA member) who gains the highest CW score. (Minimum score — 50 points)

As usual, we are hoping for good participation on the part of the OMs, and this is a golden opportunity to gain points for the attractive ALARA Award (this year with Bicentennial Sticker), the Mavis Stafford Trophy, or any of the YL awards available in 1988.

With improved propagation we are hoping some of our DX members may be on air during the contest, and look forward to catching up with them.

Let us see if we can make this contest the most successful yet!

Logs should be posted to: The Contest Manager, Marlene Perry VK3JAW, 218 Ninth Street, Mildura, Vic. 3500, no later than December 31, 1988.

AWARD UPDATE

No 74 — 3.6.88 — Marilyn Syme VK3DMS,
1 endorsement sticker
1 Bicentennial sticker

The Bicentennial stickers will only be available until the end of December, so don't delay much longer, get your application in to: The Awards Custodian, 16 Byron Street, Box Hill South, Vic. 3128. Remember, the only contacts not counted for the award are those made on the *Official ALARA 80 metre Net* on Monday evenings. Contacts made on any other net, contest, etc. will be counted.

Cost of the award is $3 or seven IRCs.

Endorsement stickers are issued for 10 additional ALARA members, (including DX members), cost $1.

VI88WIA

ALARA will be using the Bicentennial call sign, VI88WIA, once again from October 31 to November 13. It will be used during the ALARA Contest.

QSL via the VK5 Bureau.

Marlene Brown VK3FML.

VK3 BROADCAST

On Sunday, September 4, the WIA VK3 Divisional Broadcast was handled by four ALARA members, Mavis VK3KS, Mavis VK3BIR, Marlene VK3FML, and Cathy VK3XBA. From all accounts the whole thing was very professionally handled. Congratulations to the ladies concerned.

The VK3 ALARA Birthday Luncheon was held on July 31, 1988. From left, Jessie VK3VAN, Gwen VK3DYL, Bron VK3DYF, Raedie, Phil VK3PYL, Marlene VK3FML, Bonnie VK3PBL and Margaret VK3CWA.

Christine Taylor VK5KTY, using the VI88WIA call sign during July 1988.

YLRL 50TH ANNIVERSARY AWARD

The Young Ladies Radio League would like to invite readers to join in the celebration of their 50th Anniversary in 1989. They are offering a special award in recognition of the event.

The YLRL 50th Anniversary Award is available to any licensed amateur world-wide.

Two-way communications must be established on the amateur radio bands with 50 YLRL members during the calendar year 1989. Any and all amateur radio bands may be used. Cross-band, repeater or net contacts *do not* count.

Applications must be received no later than December 31, 1990, and should include a list of contacts, including date, call sign, time, RS/T, band and mode. Please indicate and sign your log that you have operated consistent with the rules of the award and your license privileges. Include your name, call sign and mailing address. Applications should be accompanied by US$4 in the form of an International Money Order or five IRCs. Any proceeds over and above the cost of printing and distributing the certificates (should there be any) will be transferred to the YLRL Scholarship Fund.

Decisions of the Certificate Custodian regarding interpretations of these rules as here stated or later amended shall be final. All inquiries regarding applications or the certificate should be addressed to the Custodian: Joan M Gibson KG1F, RR1, Box 1465, Waterbury, VT 05676, USA.

—Compiled from *YL Harmonics*, July/August, 1988

BITS AND PIECES

Congratulations to Mavis VK3KS, who won the gold cup in the CW and SSB sections of the 1988 DX-YL to NA-YL Contest as DX winner. The North American YLs who won gold cups were Shirley WD8MEV (SSB) and Elizabeth VE7YL (CW), both ALARA members.

Congratulations also to Marlene VK3FML, who managed to pass all the examinations, NAOCP Regulations, AOCP and CW in the one day. A great effort.

Also on the list for congratulations are Noela VK4ANJ (ex-VK4KCU) and Joanne VK4CYL (ex-VK4LCD). Good to hear you have upgraded.

NEW MEMBERS

New members for ALARA are Maggie VK3CFI and Mary ZS5V. A very warm welcome to you both.

Until next month, 73/33, Joy VK2EBX.

ar

HELP WANTED

A notice was placed in August 1988 issue of AR asking for the assistance of amateurs who would be prepared to peruse several of the foreign language amateur radio magazines we receive in the Federal Office, with a view to keeping us informed of events and interesting technical articles.

The response was gratifying, and I thank all those amateurs who wrote to the Federal Office.

Only one language was not covered, Italian!

We regularly receive the Italian amateur radio magazine, *Radio Rivista* and it looks to be a most interesting magazine.

Is there an Italian literate amateur who would like to be sent this magazine each month, in return for keeping us informed of any news items and technical articles that would be of interest to Australian amateurs?

If so, please write to: Foreign Publications, WIA Federal Office, PO Box 300, Caulfield South, Vic. 3162.

ar

SWEDISH STUDENT IN GEELONG

A year in Australia as an exchange student for 17-year old Christian Viebke, has seen him make many friends, particularly through the hobby of amateur radio.

Christian comes from Sodra-Sandby in the southern province of Skane, Sweden, and is proud to a member of the Geelong Amateur Radio Club in Victoria, Australia.

He is in Australia as a "Youth for Understanding" (YFU) exchange student attending Geelong High School and has spent the year living at Leopold, a suburb of Geelong on Corio Bay. A keen interest in amateur radio and shortwave listening brought him into contact with the Geelong Amateur Radio Club.

Among his many friends at GARC is Russell Walker VK3CM, who has helped Christian operate on the DX bands, including working several Swedish stations.

High on his priorities list upon his return to Sweden is to obtain an amateur radio station licence so he may keep in touch with his GARC and Australian friends.

At the conclusion of his schooling, Christian hopes to be accepted into the Swedish Navy for training as a radio operator.

He is also a keen medium wave listener and has been busy sending comprehensive reports to Australian stations which he has heard on a borrowed FRG-7. One of these reception reports found its way to the desk of Bob Girdo VK2RG, Chief Engineer of Radio 2UW, Sydney. Bob happens to be an Area Co-ordinator with YFU and invited Christian to visit Sydney for a few days.

During the visit in late-August, Christian received a specially engraved Morse key as a memento of his visit.

When asked about his Australian exchange experience, Christian indicated he felt that amateur radio and the YFU scheme has common aims, both promoting international friendship and understanding.

Christian is one of 432 YFU exchange students from 16 countries in Australia for a year.

Apart from Geelong and Sydney, he has travelled to the Alice Springs outback and the rugged south-coast of Victoria.

He returns to Sweden in December.

ar

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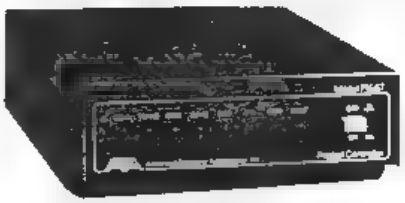

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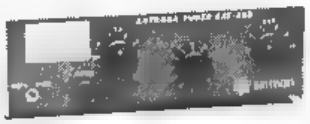

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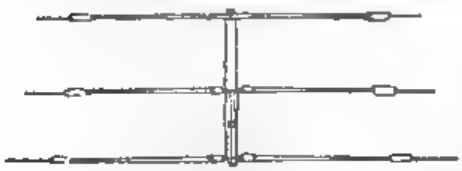
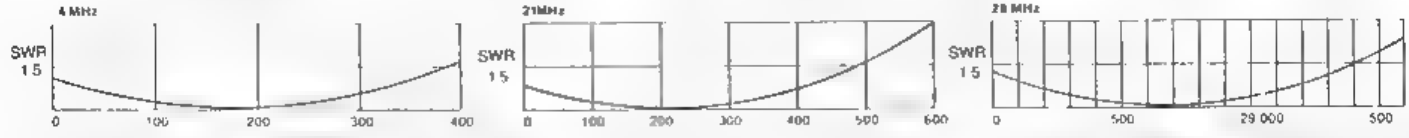


SPECIFICATIONS:

	HB33DX	HB43DX
Frequency	14/21/28 MHz	14/21/28
No of Elements	3/3/3	4/4/4
Gain (dBd)	8.5/8.7/8.3	9.4/9.5/9.8
F/B Ratio (dB)	22/24/21.5	24/24.7/22
	1.5 or better	1.5 or better
Power Rating	2 kW	2 kW
Impedance (ohm)	50	50
Element Length (metre)	8.25m	8.25m
Boom Length (metre)	4.0m	6.0m
Turning Radius (metre)	4.54m	5.1m
Wind Surface Area (m²)	0.58m²	0.74m²
Wind Load (EIA STD 80 MPH)	56.7 kg	72.7 kg
Weight (kg)	15 kg	19.2 kg
Price	$480	$580



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FAX: (07) 394 4316

Education Notes

Brenda Edmonds VK3KT
FEDERAL EDUCATION OFFICER
PO Box 883, Frankston, Vic 3199

During a recent discussion at a club meeting, the suggestion was made that amateur radio is something of a "secret society". Although we talk radio extensively and endlessly w thin our known groups — clubs, on a r, at conventions — we do not bring our hobby into the conversation at the work place or in our social activities.

I wonder how true this is for the majority of amateurs. Was this a representative group? I have taken the idea a little further since then, and have, from a limited sample, had more encouragement than disagreement.

The further point has been made that listing amateur radio as a hobby or interest in a job application could actually d sadvantage the applicant, as it has overtones of fanaticism, and arouses suspicions of instability!

I would be very interested to hear members' opinions on these suggestions, and in particular, if anyone has actual experience of discrimination on the basis of being an amateur.

There are two points here:

1. Are we ashamed of our hobby, or unwilling to share it, if we do not discuss it outside the known circle?

2. What s the 'average' employer's view of amateur operators?

On point 1, we are quite happy to advertise our amateur activities to the neighbours and passers-by when we erect towers and antennas, yet we hesitate to bring radio into the conversation in a non-amateur group. Perhaps we feel that our audience will not understand technical terms, and will think of us as 'mad CBers'.

On point 2, if the employers generally hold a poor opinion of amateurs, perhaps we should be doing something about our ' mage'.

By now you have no doubt guessed that this article is back on the old track of *how do we recruit new operators into the hobby?*

It is becoming apparent that we have an 'image' problem, and that the average non-amateur has a rather distorted view of our interests and activities. We tend to be blamed for any or all the TVI and BCI, or at least the towers are blamed.

The publicity we get is more often unfavourable than favourable, due frequently to the medias inability to distinguish between us and the aforesaid CBers.

Please do not conclude that I am anti-CB in general. I am not, and I make the point that many of the amateurs who are now giving selfless service to the hobby and the Institute first became interested n radio through CB.

But. CB probably still has a worse ' mage' than the amateur service, so if the public cannot tell us apart we all go down together.

We should put in a good word for the CBers when we can, as enlightened self-interest, at least.

Two approaches have been suggested, (there are others also) We may be able to educate the public about our activities if we take whatever opportunities offered to explain to non-amateurs what we do and what we achieve, and to publicise better the community services and international goodwil. we provide. It is, after all, the only hobby where private individuals of different nations can communicate directly with one another.

The other approach is to welcome and encourage more CB operators to join our ranks. One of our number has undertaken to tour his area and drop a leaflet into each letter box where an antenna is in evidence. The leaflet will invite the operator to the nearest club meeting, and explain the increased privileges acquired on gaining an amateur licence.

If any readers would like to carry our a similar exercise, let me know and I will arrange a supply of leaflets.

My best wishes to those sitting for the November examinations. May you all get nice new licences for Christmas.

Have you thought about giv ng a friend a WIA membership for Christmas? Why not do so?

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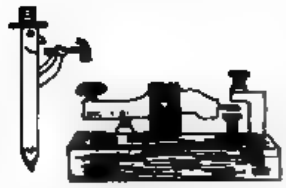


Pounding Brass

Gilbert Griffith VK3CQ
7 Church Street, Bright. Vic. 3741

A belated thanks to all who have written to me over the last few months. It is sometimes difficult for me when I realise that it will be six weeks or so until you read this, when I would like to thank correspondents a little sooner. Some of the letters ask for information and some send it. Thanks Graeme VK6GZ for the regulations. And I hope Marlene VK3FML, has her new Bencher paddle by now. Don't let Jim have it Marlene! I hope Phil VK3CDU keeps in touch too.

Going back through my log I see only a few dozen contacts (apart from contests) these past months. I managed to work Gary ZL1AN, who writes the "Morseman" column for *Break In*. But I haven't had time to fire up the QRP unit at work.

In the RD contest this year, I made 168 contacts of which only one was a novice (VK7NRV) and he was my second last contact. Where are all the novice operators? Other amateurs in the contest mentioned the dearth of novices, so what is the matter? Is it our fault for going too fast? Or just for not passing on our enthusiasm?

Novice candidates are required to pass a simple examination in Morse code at five words per minute. As many a full call holder knows, even a pass at 10 words per minute is not much good when attempting one's first on-air contacts. Do you remember?

Okay Morsiacs, what are we going to do about it? Better still, what are you personally going to do . . . to help both novices and AOCP phone operators find out how much fun and interest they can get from Morse, without the expense involved in experiments with packet, moonbounce, and other exotic modes. Are you guilty of saying to yourself, "It's only the Novice Contest, I won't waste my time" or " I can't be bothered slowing down to 10 words per minute"? Do you despair at poor Morse and only work stations that are easy to copy? Rather than give them a go and maybe point out to them that they need to improve their (say) spacing.

I realise that there are a few Morsiacs out there who are busily conducting teaching and practice sessions on most nights of the week and good on them. But what about the other couple of hundred regular Morse enthusiasts, it is to you that I am pointing, do you acknowledge any of the above? You have discovered the joys of the mode and were probably helped in some way, so are you going to help others in turn?

"So what can I do" you say.

And I say, here are some ideas. Some I have used and many I just don't have time for, even though I could make time for some if I really wanted.

1. Write a monthly column in a magazine.
(But not Pounding Brass unless you want to try and take over from me!)
2. Do something on-air.
   a) Give lessons.
   b) Criticise
   c) Enter the Novice Contest next time.
   d) Work a Novice a day — or a week.
   e) Be nice (and understanding) when you do.
3. Take your keyer and paddle, or key and oscillator, to the next convention or field day and put it on display for people to play with.
4. Mount your key collection on a display board and take that. You might even sell it! But at least you will have many people to talk to about it.
5. Put all your awards (for Morse, of course) on a board and display it at a meeting or a convention — or even at the local school.
6. Give a talk at your local
   a) Service club.
   b) School.
   c) Scouts and/or Guides.
   d) Church group.
7. If you discover a circuit or modification or kit that you have put some time and effort into to improve your shack, publish it in AR. Even if it doesn't work or you make a mistake, it will generate plenty of interest. And you may get some advise on more improvements. (You may even win one of the AR awards!).
8. If you see a new piece of Morse related equipment here or overseas, write up the details and send it to AR so that others can find out about it. Or tell me and I will follow it up, as I love playing with new equipment.
9. Organise a CW-only award through your local club. It seems to me that many awards cater to the SSBers only.
10. Make cassette tapes of Morse code at different speeds and run a competition at your next convention. (A great way to meet all the Morsiacs at a convention). Maybe you could run a test for *accuracy* at five or 10 words per minute for novices and K-calls, ie not a speed event.
11. Organise an on-air net where the people sending are taped by you and the next night (or week) you send their Morse back to them to see if they can read it. Then have a discussion to see where they made mistakes and how to correct them.
NOTE I have a recorder permanently connected to my rig, it comes in handy for Intruder watch reports.
12. Build a torch with a Morse key for a switch and have fun making contacts by eyeball at night. (Is this ultra-SHF?).
Build a circuit that buzzes when lit from the light from the torch above, and use it until you can read the code visually. If the children see you playing with this sort of equipment you will have to fight them off!
13. How about a "Critical Net" where members rubbish each others sending, hopefully to everyone's benefit. QLF? would be sure to get a lot of use in a net like that.
14. Apply to be an "Official Examiner" of Morse code.
15. Connect a Morse key to your car horn. Great for visiting amateurs.
16. See how many different keys or keyers you can connect to your rig at once and have them all working. Great for sorting out a poorly set-up shack as the RF gets into the connecting leads and eventually locks the transmitter on.
17. Organise a swap night of keyers or keys to find out if your key is as good as you think, and whether another type suits you better.

Whew!

As you can see I have more ideas than I have time to try them.

I usually take a few boxes of junk (goodies to you) to conventions to sell or swap and it is no trouble to set up a keyer and paddle on the table for people to play with, it is a good talking-point too! And yes folks, I too usually end up taking more junk home that I brought with me! This year I hope to set up my QRP station as a display, so see you there.

Giving a talk at Rotary or Apex club dinners can be lots of fun. After a few times, the stage-fright wears off. Guaranteed.

Taping Morse from your rig is easy, especially if you can pick up an old recorder at the tip for free. Many circuits have been published from time to time to convert the audio to drive a relay to key your rig and the simplest is a step-up transformer and rectifier driving a relay direct. That way you don't need a power supply. You can tape intruders and send the tape to your intruder watch co-ordinator. Or slow down the speed enough to copy yourself.

As the *Handbook for Operators of Radio Stations in the Amateur Service* states:

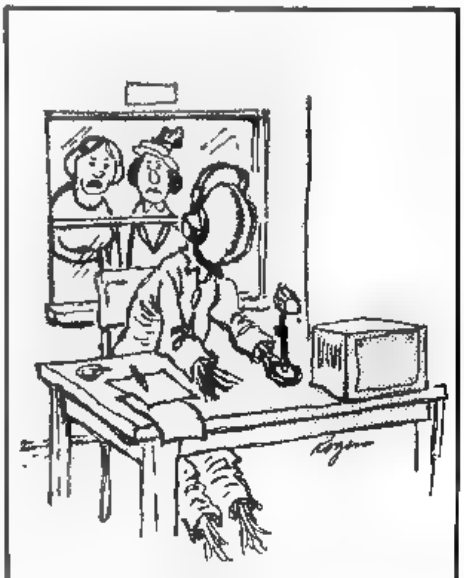
"Ability to send correctly, and to receive correctly by ear, in Morse code, a message in plain language (English) — including figures — at a speed of 10 words per minute."

It is plain that this rule is not going to be enforced as most of the amateurs in Australia wouldn't have a chance of passing a re-test even if they owned a key! It is therefore up to us alone, to keep Morse code alive. Even if it means going well out of our way in demonstrating how much fun the mode can be, and helping to show how easy it really is after the admitted initial difficulties of learning to use the new language on-air. All amateurs have to learn the language so it seems a pity to waste that learning in the belief that the mode is difficult to master. Clubs such as the CW Operators QRP Club would benefit if they had a list of newly licensed amateurs to send literature to in the hope of attracting them to Morse code.

On closing for this month, I will mention that if you need a circuit for a tape to rig interface, drop me a line (with a stamped addressed envelope please if you want a reply) and I will be glad to help. I will not be ordering any more Curtis 8044 chips and those who asked should have theirs by now. It is just too easy to order d rectly from overseas and I did not get the quantity orders to make it worthwhile, ie buy bulk. I hope to have a report on a locally designed keyer with memory in the near future, just as soon as I build it, if not sooner. So keep your ears on!

I am still waiting for details of an 80 metre receiver kit from Dick Smiths so I hope to be able to report on that also early in the new year.

73 Gil.



"I gotta keep an eye on him all the time or he's down at the radio shop spending money."

Electro-Magnetic Compatibility Report

Hans Ruckert VK2AOU
EMC REPORTER
25 Berrille Road, Beverly Hills, NSW 2209

CASE NO 1 — THE VE3SR CASE

Reprinted from *QST* March 1988

Comment:

What we may learn from this case.

1 The Government makes the aws.
2. The judges can only interpret existing laws, if they think there is a law which fits the assumed crime.
3. Inadequate outdated laws may result in unfair verdicts.
4. It would be desirable f cases which require expertise in an area not usually taught at law-school could be left to radio inspectors and their departments to decide who is actually responsible and who should do what to resolve the problem
5. It is regrettable that the defendant may have to be very rich to afford legal representation in order to get a fair trial.
6. It is well-known that, in the majority of EMC collision cases, design deficiency of the affected equipment causes the problem In countries with no legally binding EMC standards the judges do not seem to be properly equipped "to fit the punishment to the crime" The result can be, that one Government department checks the legality of a transmitter operation, whilst another government agency calls the transmission a "punishable nuisance". The defendant (nnocent In countries with logically and technically correct EMC standards) is driven bankrupt, unless legal or financia aid comes to the rescue.
7. This very unsatisfactory situation explains why the manufacturers of the affected equipment were apparently not involved in the legal process. They would be the best equipped to improve their products, saving all concerned much frustration and money.

THE JACK RAVENSCROFT DECISION

Reprinted from *QST* March 1988

The appeal in the Jack Ravenscroft case has been partly successful. For those unfamiliar with the case Jack VE3SR, an Ottawa-area amateur, was taken off the air and ordered to pay costs and damages to a neighbour who had complained that Jack's amateur radio transmissions had interfered with the operation of electrical and electronic equipment in her home. That decision was reviewed by three justices of the Ontario Court of Appeals in Toronto on January 28-29 Here is their judgment:

1. The injunction banning Jack from transmitting is lifted and Jack may return to the air
2. However, within 90 days, Jack must arrange for modifications to his neighbour's equipment, modifications that will suppress interference resulting from his transmissions, *to a standard approved by DOC*. Failing this, upon application to a district court judge, the injunction is reinstated.
3. If Jack's neighbour refuses to allow such modifications, the injunction is lifted permanently.
4 The award to Jack's neighbour is increased from $2500 to $5000 The increase is to compensate Jack's neighbour for inconveniences she will suffer while her equipment is being modified. Jack continues to be responsible for approx mately 60 percent of the costs incurred by his neighbour prior to the original trial. No additional costs are awarded, either to Jack or to his neighbour. This basically leaves Jack and his neighbour responsible for their own costs.

It is probably dangerous to speculate on what this judgment means for the Canadian amateur radio community. However, the judgment seems to imply that:

1 Solving an amateur radio interference problem is a responsibility that must be shared by both the radio amateur and those experiencing interference. The amateur must be prepared to arrange for modifications to susceptible equipment, modifications that will suppress the interference. Those experiencing the interference must be prepared to accept these modifications. If they refuse, the amateur may continue operating.
2. DOC must become involved in these matters, even if the interference is to non-radio equipment. In fact, they must become an arbitrator and determine when the amateur has done all that can be reasonably expected and when those experiencing the interference must take responsibility for the susceptible nature of their equipment.

The appeal was condycted by a team of lawyers from the Toronto firm of Borden and Elliot. Each lawyer worked in his own area of expertise: constitutional law, law of nuisance or the principle of statutory authority. Those who attended the appeal found the lawyers well prepared and persuasive. They agreed that Jack probably had the best representation possible.

At press time, the judgment appeared to be acceptable, both to Jack and Jack's neighbour.

CASE NO 2 — JUSTICE FREE OF CHARGE!

This reporter is grateful to Wilfried Hercher DL8MX, (Hochstadt/Main) for permission to publish his 14th EMC collision case:

A neighbour complained about television interference. His latest television set, VCR use and satellite television reception was affected, all channels were gone, even when DL8MX was only transmitting with 100 watts output. The neighbour was advised to obtain a complaint form from the post office (standard practice in West Germany), fill in all details describing his installation (antenna) and all equipment details (manufacturer, model, serial number, date of purchase, address of dealer, etc) and send this to the local radio inspector (post office). The radio inspector will only attend to a complaint after all relevant questions have been answered like: Which FTZ-EMC approval number does the equipment carry?

Soon after, two radio inspectors arrived. One went to the neighbour with a FTZ approved and tested television set (immunity rating of 3 V/m field strength) connecting this receiver to the complainant's television antenna (which had to be installed above the roof and use a coaxial feeder, otherwise the inspectors would not come!). The other radio inspectors went to the shack of DL8MX. Both inspectors maintained contact via hand-held transceivers. All receiver operation combinations, like television channels, VCR, Hi Fi receiver, and satellite television was tried. There was now not a single case of reception disturbance, as long as the correctly designed television set was used.

This demonstration convinced the neighbour that only his new television receiver was to be blamed for the disturbance, not the transmitter operation of the radio amateur. DL8MX could even run 800 to 900 watts of power on any shortwave band with his beam and the television antenna only 10 metres apart and pointing at each other. The radio inspectors wrote a detailed report, giving a copy to the neighbour, and another to the dealer, who would also inform the manufacturer.

A few days later the television set was exchanged for a model which had honestly earned the FTZ-EMC approval number. This solved another EMC collision case without cost to the neighbour and the innocent radio amateur This was achieved without frustration, long delay and high cost of a legal process w th technically ill-equipped legal representatives. The radio inspectors stated that more customers should complain to force all manufacturers "to do the right thing", as others did years ago economically

Who says it can't be done?

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WICEN News

A short time ago I received a copy of the recently compiled WICEN Victorian Region Co-ordinator's Manual. Leigh Baker VK3CDP, the Victorian Co-ordinator and his colleagues, are to be congratulated for such a fine document In addition to the routine, yet necessary, registration forms and administrative records, Leigh ncludes very useful sections on the State DISPLAN, compensation procedures for volunteers under the Victorian Emergency Management Act, and some very helpfu briefs for specific operating sites.

These last named are set out as installation reports showing where WICEN is to set up at, for example SES Headquarters or Red Cross, what equipment is permanently installed, how access is obtained and the observed repeater coverage from each site Indeed, they provide very useful instructions for a WICEN team to go to one of the specified sites and set up with minimal confusion and maximum efficiency.

It certainly beats often vague verbal briefs on "how we did it last time (and got it wrong!)" from an old hand.

Leigh notes the manual is available on floppy disc, IBM formatted in Wordstar 3.3. Any WICEN group interested in obtaining a copy should contact leigh at the Victorian Divisiona address or Victorian WICEN at, PO Box 106, Mitcham, Vic. 3132

Well done Leigh, and VK3.

—Contributed by Bill Roper VK3ARZ

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AMSAT Australia

Colin Hurst VK5HI
8 Arndell Road, Salisbury Park, SA 5109

SATELLITE ACTIVITY FOR JULY/AUGUST 1988

1. LAUNCHES

The following launching announcements have been received:

INT'L NO	SATELLITE	DATE	NATION	PERIOD	APG km	PRG km	INC deg
056A	Okean 1	Jul 05	USSR	97.5	668	661	82.5
057A	Cosmos 1957	Jul 07	USSR	89.7	256	194	82.6
058A	Phobos 1	Jul 07	USSR	See		note	
059A	Phobos 2	Jul 12	USSR	See		note	
060A	Cosmos 1958	Jul 14	USSR	92.4	417	376	65.8
061A	Progress 37	Jul 18	USSR	88.8	273	194	51.6
062A	Cosmos 1959	Jul 18	USSR	104.5	1010	976	83.0
063A	INSAT 1C	Jul 21	India	1445.7	35969	35808	8.2
063A	ECS 5	Jul 21	Europe	1429.1	35883	35418	8.1
064A	Meteor 3-2	Jul 28	USSR	108.4	1221	1198	82.5
065A	Cosmos 1960	Jul 28	USSR	94.5	516	475	65.9
066A	Cosmos 1961	Aug 01	USSR	24h23m	36312		1.4
067A	PRC 23	Aug 05	China	89.5	296	294	63.0
068A	Cosmos 1962	Aug 08	USSR	90.4	297	215	70.8
069A	Molniya 1-73	Aug 12	USSR	12h18m	40754	617	62.9
070A	Cosmos 1963	Aug 16	USSR	89.9	376	181	64.8
071A	Gorizont 16	Aug 18	USSR	23h55m	36772		1.3
072A	Cosmos 1964	Aug 24	USSR	89.4	297	215	70.8
073A	Cosmos 1965	Aug 23	USSR	89.7	295	195	82.5

2. RETURNS

During the period 115 objects decayed including the following satellites:

1974-102A	Molniya 2-11	Jul 07
1985-089A	Cosmos 1688	Jul 02
1988-037A	Cosmos 1942	Jul 04
1988-049A	Cosmos 1952	Jun 25
1988-055A	Cosmos 1956	Jul 07
1988-054A	Cosmos 1955	Aug 20
1988-061A	Progress 37	Aug 12
1988-067A	PRC 23	Aug 13
1988-068A	Cosmos 1962	Aug 22

3. NOTES

1988-058A Phobos 1

[redacted]

These two spacecraft will probe Mars and its moon, the Sun and interplanetary space.

The on-board equipment has been developed by scientists of 13 countries and the European Space Agency. The main task is to obtain a chart of temperatures of the martian surface; to study the daily and seasonal dynamics of its thermal regime; the measurement of thermal inertia of martian soil; the quest for the areas of heat emission and perma frost zones and mineralogical composition of the [redacted].

1988-061A Progress 37:

The spacecraft docked with space station MIR on July 20, 1988.

1988-062A INSAT 1C:
1988-063B ECS 5:

These spacecraft were launched from Kourou, French Guiana by the European Space Agency.

[redacted] PRC 23

This retrievable satellite with experiemtal devices from the Federal Republic of Germany on board, conducted scientific exploration and technological experiments and then returned to earth after eight days in orbit.

—Contributed by Bob Arnold VK3ZBB
er

DEADLINE FOR JANUARY IS NOVEMBER 7, 1988

QSLs from the WIA Collection

Ken Matchett VK3TL
776 Warburton Highway, Seville, Vic. 3139

The QSLs this month are from a King, a Prime-Minister and a US Senator. The fact that such eminent persons prefer to use their first names rather than their titles, emphasises the friendship that extends throughout the world of amateur radio.

JY1

This QSL from Jordan must be one of the few (possibly the only modern one) that lacks letters in its suffix. Normally, of course, an allocated call sign has one or two letters following the numeral — this one has none. It is the QSL of the King of Jordan, Hussein ibn Tala. Born on November 14, 1935 in Amman, he has been ruler since 1953 when he was crowned as a 17-year-old. Throughout his reign he has augmented the military establishment effectively asserting royal authority over that of Parliament. In 1979, Hussein's Government abandoned its traditionally pro-western orientation in favour of non-alignment. (The country was first under British mandate, but became independent in March 1946). The QSL is signed simply "Hussein I".

The reverse side of the QSL shows an outline of the country. However, the territory to the north-west of the map has been occupied by Israel forces since the six-day war of 1967.

The date of the QSO is shown as November 1970, two months after the start of a Jordanian army offensive against Palestinian refugees who had fled the West Bank and occupied the East Bank (of the Jordan River).

In the centre of the outline map are the Royal Arms, a crown on top of a shield in the centre of which is an eagle. These symbols were the emblems of Saladin, the great Sultan of Egypt and Syria whose military successes led to the third Crusade in the 12th Century.

Several members of the royal household are radio amateurs including Hussein's wife.

9M2TR

His Highness, Tunku Abdul Rahman, was born on February 8, 1903. After studies in England, he returned to what was then known as Malaya, and entered the Kedah Civil Service.

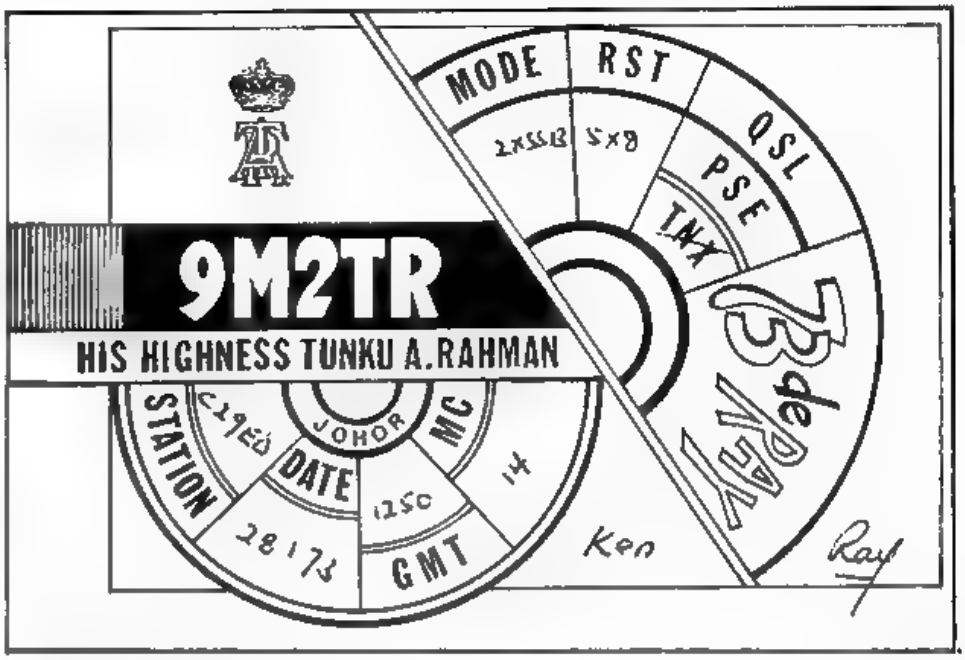
He led a mission to London in January 1956 for the purpose of negotiating independence for his country. This mission secured immediate internal self-government and the pledge of independence by August 1957. Popular sentiment for independence had swelled during and after World War II, which led to the Federation of Malaya established from the British-ruled territories of peninsula Malaya in 1948.

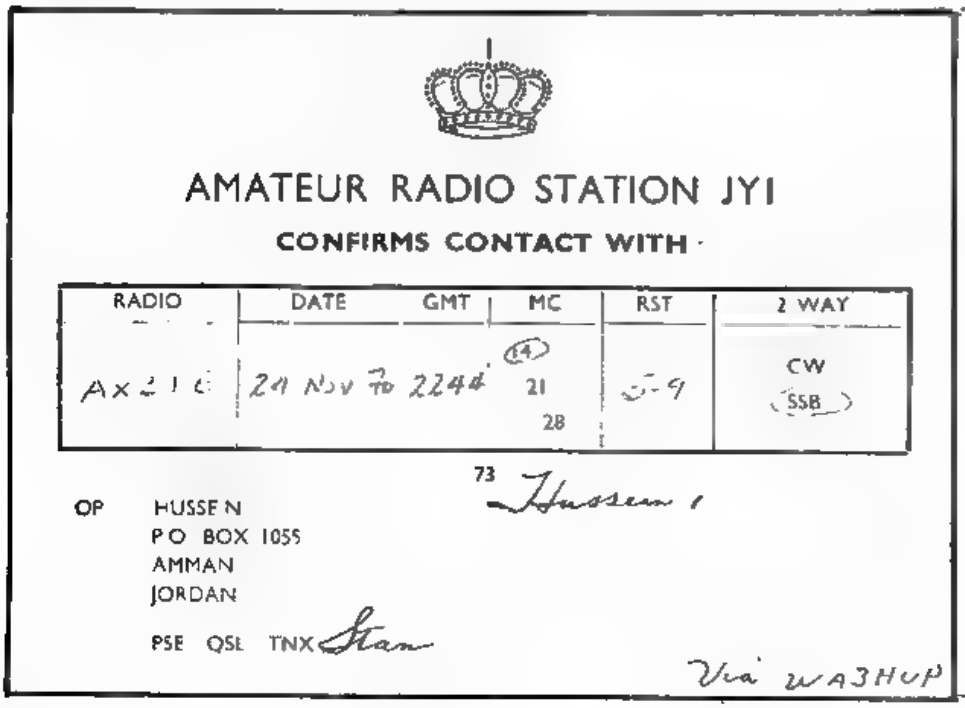
The colonies of Singapore, Sarawak and Sabah joined this Federation on September 16, 1963 to form Malaysia. (Singapore withdrew in August 1965).

The Tunku (the word means Prince) became the first Prime-Minister of independent Malaya (1957-63) and then of Malaysia from 1963-70, when he stepped down from this position, handing over to Tun Abdul Razak.

The QSL shows the Royal Crown over the initials of His Highness. The QSL acknowledged a QSO between His Highness and the writer (when active from Nauru as C29ED), the former signing with an informal "Ray".

Malaya became a deleted country on the ARRL DXCC Country List after September 16, 1963 when Malaysia was formed, being replaced by territories making up the new Federation of Malaysia.




AMATEUR RADIO STATION JY1

CONFIRMS CONTACT WITH

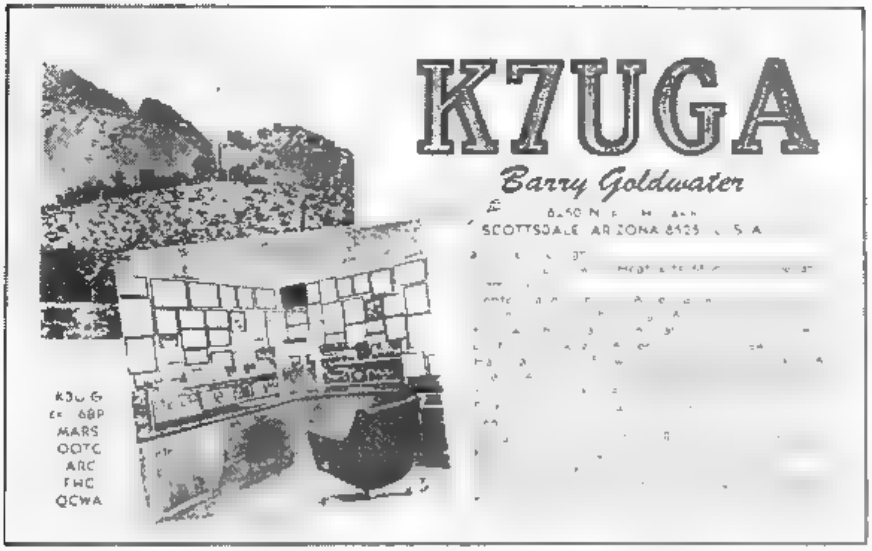
RADIO	DATE	GMT	MC	RST	2 WAY
AX2 1 C	24 Nov To 2244		(14) 21 28	5-9	CW (SSB)

73 Hussein I

OP HUSSEIN
P O BOX 1055
AMMAN
JORDAN

PSE QSL TNX Stan

Via WA3HUP



K7UGA

It would be difficult indeed to find a politician of any political colour who has done more for the cause of amateur radio than Senator Barry Goldwater, of Arizona.

As a youngster in the 1920s he held the call sign 6BPI (there was no W prefix then) using a five watt tube and a spark transmitter made from an old Ford automobile HT ignition coil. Known by most people as a former candidate for the US Presidency, the Senator will be best remembered by the amateur radio fraternity for the encouragement given to the introduction of reciprocal licensing. The Senator introduced and guided through both Houses of Congress the Bill which was later to become law. This was a new concept in amateur radio which proposed that foreign amateurs licenced by certain countries would be permitted to use their own call signs (with suitable portable designator) in the US. A similar arrangement was to operate for American amateurs visiting other countries. The idea spread throughout the world until today there are few countries that do not offer this privilege to licenced amateurs.

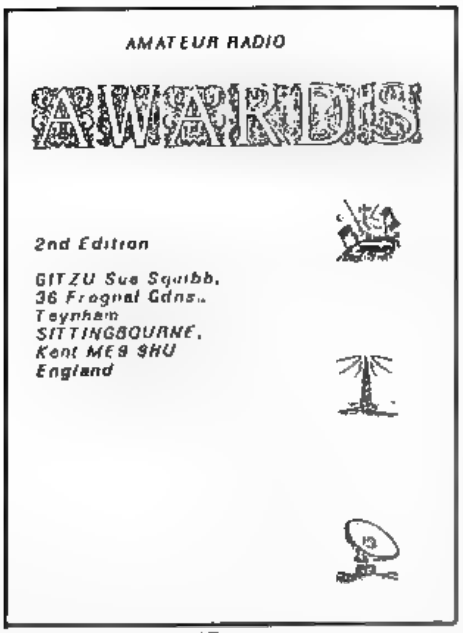
It was President L B Johnson who signed the relative Senate Bill on May 28, 1964, which amended the (US) Communications Act of 1934. The Senator's own QSL card is shown here, the QTH being Scottsdale, Arizona.

BV0BG

During the first week of January 1986, Senator Barry Goldwater led a group of Washington DC amateurs to Taiwan. The information on the reverse side of the QSL states that the station BV0BG (no prizes for working out the significance of the call sign suffix) was established in Taipei, the capital city with a population of over two million. Amongst the 7000 QSOs made world-wide in seven days were the first ever from Taiwan on 80 and 160 metres. The DXpedition was conducted with the help of the China Radio Association (CRA). The prefix BV0 is quite unusual and is used for a special purpose. In 1954 the Chinese Nationalist Ministry of Communications allocated the BV prefix for amateur use with a number indicating the particular 'haein' or county. Previously the C3 prefix had been used for Taiwan (formerly called Formosa) and for a short time these call signs were both monitored and tolerated by the authorities.

The Senator is seen in the photograph making a phone contact. The flags of both nations side by side symbolise the close ties existing between the Nationalist Chinese Government and the US.

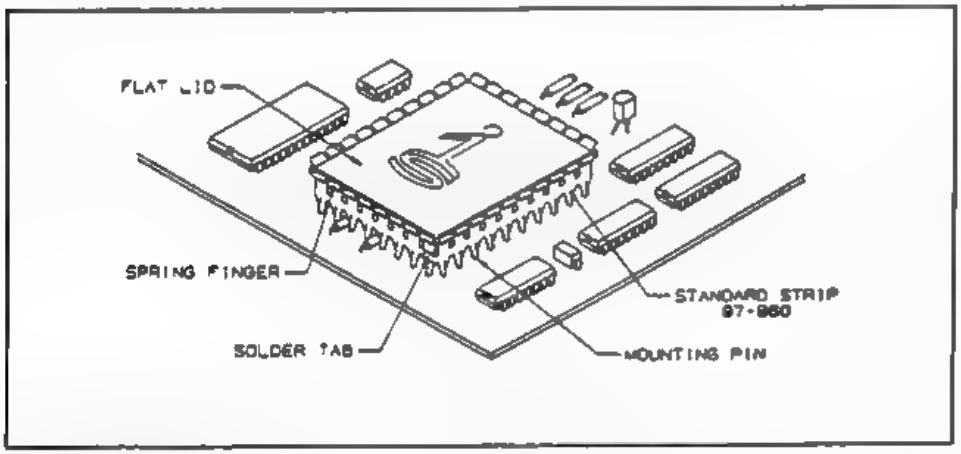
A R Showcase



AWARDS BOOKLET

News comes from England of the publication of the second edition of *The Amateur Radio Awards* booklet by Sue Squibb G1TZU.

There are over 350 awards in the 90 page booklet, which is available at a cost of £5, US$10 or 20 IRCs from Mrs Sue Squibb G1TZU, 36 Frognal Gardens, Teynham, Sittingourne, Kent, ME9 9HU, England.



PCB SHIELDS

New PCB shields permit shielding of selected PCB components, without the expense and time-consuming effort of forming complicated punches and dies to create specially-shaped boxes. The new shield can be readily shaped to specific requirements and solder-mounted on a PCB. The shield controls EMI emissions, susceptibility, and cross-talk and can be used on any through-pin, multi-layer board designed to accept it.

To form a shield, a strip of phosphor bronze, a conductive spring material, is bent to the appropriate shape to form a "fence" around the components to be shielded. A flat metal lid is then cut to shape, using a simple tool such as shears, and is snapped into place. The lid is held by the spring force of the "fence" material.

A unique advantage of the PCB shields is that the cover can be removed, without special tools, for access to the components under the shield. (Common solder-mounted boxes generally prevent access to the shielded components inside).

The shield can conform to any shape or size. The current version has pin spacing of 0.200 inches, distance from board to cover of 0.400 inches, and an overall height of 0.5 inches. Currently, strips are available in lengths of 12 inches or less, with continuous lengths available on special order.

The material normally is supplied with tin plating to facilitate soldering, but can be plated with other materials if required. The shield is preferably used on boards with two or more layers, so that a ground plane is available to serve as the bottom of the enclosure. For ease of installation, round mounting holes are used, so no special milling is required to create locating slots.

Test results indicate that the shield exhibits attenuation characteristics as great as 34 dB at 1 GHz.

For more information, a sample kit (containing a six inch strip plus a sample lid), and additional technical specifications, write to RFI Industries Pty Limited, 54 Holloway Drive, Bayswater, Vic. 3153 or 50-56 Barry Avenue, Mortdale, NSW. 2223. Also, request the free Guide to Interference Control, describing the complete line of Instrument Specialties RFI/EMI shielding strips.

ICOM IC-A20

With the IC-A20, the sky is the limit!

You might think it is good enough to offer a precision engineered VHF transceiver with 16 user-programmable memory channels and a full 108-136 MHz band coverage.

Put it in a weatherproof, dust-tight, rugged case to stand up to rough weather and some not so delicate handling, add 720 communication and 200 navigation channels and you are starting to talk of something just a little out of the ordinary.

Include VHF Omni-directional Range (VOR) reception for point to point navigation and put it all in a case just 65 x 198 x 35 millimetres (WHD) and capable of operating in an aircraft or on your belt, and you have the IC-A20.

The Icom IC-A20 is a compact, light-weight, hand-held VHF air band transceiver with full transmit and receive coverage of the 720 communication and 200 navigation channels between 108-136 MHz plus VOR reception.

The 16 memory channels store the COM, NAV and VOR frequencies required for a particular flight plan or, if you are just riding the thermals, your nearest control tower or ground communications channel.

Front panel push-button frequency entry via a soft-touch keypad finds that next wanted frequency instantly. A large liquid crystal display (LCD) ensures you always know which channel you are on. A keyboard locking switch ensures there are no sudden, unwanted channel changes.

The 121.5 MHz air band emergency frequency can be called up instantly at the touch of a single button for crisis situations.

Up/down scanning from the front panel allows constant scanning of all frequencies within the IC-A20's operating range, or just those stored in the 16 memory channels. Unwanted memories can be "locked-out" at the touch of a button.

VOR readings can be taken directly from the front panel display, displaying both the frequency of the VOR station being received and the bearing TO or FROM the station. Flight path deviation can also be read at the touch of a button in increments of two degrees.

With full duplex (split frequency) operation, multiple NAV and COM or NAV and VOR channel combinations can be stored in the memory bank with instant recall for position cross-checking. The display even indicates when a localised signal is encountered from a VOR station.

(**VHF Omni-directional Range (VOR) is a navigation system using radio transmitters that emit a synchronisation signal equally strong in all directions, followed by a circular sweeping, directional signal. The VOR circuitry in the IC-a20 decodes these signals to determine what angle your receiver is from the VOR station, ie, what "radial" you are on. Radials are like directional beams radiating outward from the VOR station like the spokes of a wheel.)

See the Icom IC-A20 at your nearest authorised Icom dealer or contact Icom Australia Pty Ltd, 7 Duke Street, Windsor, Vic. 3181, phone (03) 529 7582 or toll-free (008) 33 8915, for more information.

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eti

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any memory channel or even all memory channels in succession, while you operate.

Add pocket beep with the optional UT-40 Tone Squelch Unit, and the IC-3210A becomes a mobile pager, sounding a 30 second alarm when the correct tone frequency is received.

See the Icom IC-3210A at your nearest authorised Icom dealer or contact Icom Australia Pty Ltd, 7 Duke Street, Windsor, Vic. 3181, phone (03) 529 7582 or toll-free (008) 33 8915, for more information.

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DUAL BAND TO HAND

With the release of the Icom IC-32AT hand-held FM transceiver, roving amateurs now have a convenient, compact dual band transceiver in the palm of their hand.

Not only can the IC-32AT operate over the entire 144-148 and 430-440 MHz bands, it can transmit on one band and simultaneously receive on the other — true duplex operation with telephone convenience.

Store one frequency from each band in each of 20 dual storage memory channels for simplex or instant duplex operation, and scan all 40 memories, all two metre memories or all 70 centimetre memories with the versatile Programmed Scan facility.

An advanced Priority Watch function allows monitoring the Call Channel memory, any selected memory channel or all memory channels every five seconds, even whilst operating!

The "Quick QSY" facility allows fast frequency changes, using the main dial to change the 1 MHz or 100 kHz digits, or the memory channel, directly, at the push of a button.

DUAL BAND MOBILE

What do QSK CW, talking on the twin pair and Icom's new IC-3210A have in common? They all let you hold a *real* conversation without having to wait for the button to drop!

The new IC-3210A dual band VHF/UHF mobile transceiver allows transmission on one band and simultaneous reception on another band.

With a frequency range covering (transceive) 144-148 MHz and 430-440 MHz, (receive) 138-174 MHz and 430-440 MHz, and two sets of 20 memory channels, one for each band, storing frequency, offset and tone data, the IC-3210A is very much two transceivers for the price of one.

It can be set to scan from band edge to band edge or between preset limits, over all memory channels relevant to a particular band.

A generous 25 watts of output power on two metres and 70 centimetres, generated by a custom-designed final amplifier power module, is coupled with sensitivity of less than 0.18 uV for 12 dB SINAD to stretch your operating limits.

Other features of the elegant IC-3210A include a bright colour LCD display, instant input frequency check via the front-panel monitor switch, programmable priority watch on the call channel memory,

Using a custom-designed dual-band final amplifier power module, the tiny IC-32AT generates a full 5.5 watts output on two metres and five watts on 70 centimetres.

Water-resistant rubber seals on all joints make the IC-32AT safe to operate even in rough marine environments.

The optional UT-40 Tone Squelch unit turns the IC-32AT into a personal pocket pager, emitting a 30second alarm when the selected tone frequency is received.

With features like these, and a bright colour LCD display, can you afford not to take a closer look at the feature-packed IC-3210AT?

See the Icom IC-32AT at your nearest authorised Icom dealer or contact Icom Australia Pty Ltd, 7 Duke Street, Windsor, Vic. 3181, phone (03) 529 7582 or toll-free (008) 33 8915, for more information.

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It pays to advertise!
Advertise your product or yourself in *Amateur Radio*.

Club Corner

GOLD COAST RADIO & ELECTRONICS HAMFEST

The 11th Annual Gold Coast Hamfest will be held on November 19, at the Albert Waterways Community Centre, on the corner of Hooker and Sunshine Boulevards, in Mermaid Waters.

The exhibition will include commercial and hobby displays in the field of radio and electronics — introducing such areas as amateur radio, satellite television, computer communications over radio, Tesla coils, radio teletype, receiving weather satellite pictures, vintage radio displays, computer graphics, amateur television, trade displays, scanners and much more.

Doors will be open from 9 am to 6 pm.

For further information contact Andrew Chantler VK4TAA on (075) 91 1723 (BH) or (075) 39 6609 (AH)

—Contributed by Andrew Chantler VK4TAA, Chairman Organising Committee

ar

SUMMERLAND AMATEUR RADIO CLUB

The club welcomes 10 new members who have joined recently. They are: Hugh VK2KHH, Ross VK2NUD, Phil, Richard, Terry, Paul, Neil, Harry (all SWLs), A Taylor VK4BE and Bill VK2NZ.

Hopefully they will enjoy and benefit from their association with the club and the SWLs will soon get their own call signs.

The Hamfest event was a huge success with perfect weather, good attendance and an enjoyable day for all.

The club's digipeaters on Mount Nardi (145.050 and 147.575 MHz) continues to give good service without presenting any obvious operational difficulties.

In preparation for UHF linking of the digipeater network to increase data through-put using higher speed modems and greater bandwidths than available on VHF, it is proposed that a packet subband will be established on 421 to 424 MHz and 441 to 444 MHz.

Prior to the establishment of this facility, the club has been requested to apply for a UHF working frequency on 440.050 MHz. This will offer the dual benefit of helping to populate the higher end of this amateur band and also enable local amateurs to experiment with packeting on the under-utilised band.

A permanent Summerland Packet Bulletin Board VK2YDN-1, has been established by Dave VK2YDN. This service is normally available 24 hours on 5050, and is compatible with the nationally and internationally established auto-forwarding networks.

By this time, the VK2AGE mailbox should have converted to "Aplink" — a dual mode software which allows the system to run in either AMTOR or Packet. The modes may be run independently or both simultaneously. VK2AGE has been running an AMTOR mailbox for the last six years and during that time it has seen several changes. However, this will be the first attempt to run two modes from a single microprocessor.

Contributed by Jim Cunningham VK2ESI, Publicity Officer, Summerland Amateur Radio Club

ar

PACKET RADIO BULLETIN BOARDS

September *Amateur Radio* pages eight and nine, contained an article on Packet Radio Bulletin Boards. This article was prepared in January this year for the Federal Convention by the Australian Amateur Packet Radio Association (AAPRA).

Since preparation of that article, AAPRA have been advised that the networking software METRON proposed for test does not meet the requirement DOC 71, Paragraph 9.4 with regards to identification of the sender, receiver and any intermediate transmissions. DOTC have advised TEXNET appears to meet their identification criteria and AAPRA are negotiating the use of ROSY, another networking software which also appears to contain the necessary identification requirements.

ar

Forward Bias

Norm Gomm VK1GN
GPO Box 600, Canberra, ACT. 2601

MONTHLY MEETINGS

The August monthly meeting included a presentation by Lieutenant Colonel Graham Barnard and Major Andy Haddock on *Project Raven*. The objective of Project Raven is to develop a single channel combat radio system to replace the existing range of HF and VHF single channel radios currently used by the Australian Defence Force.

Colonel Barnard explained that the new equipment will replace 12 different radios acquired on a piece-meal basis over a long period of time. The previous approach gave rise to several problems such as vastly different spares and maintenance requirements, complexity in training, lack of compatibility and declining reliability.

Project Raven will provide a fully integrated HF and VHF system with improved performance, including communications and ECCM capability, to replace all ground-based radios in the Defence Force. An important feature of Raven is Australian industry involvement in the development and manufacture of the radios.

The presentation included a display of equipment for those who "don't believe it until they see it".

The November meeting is the end of the year social function. Spouses and friends are all welcome. As we go to press, Ian Coleman VK1IC, is slated to show some slides on his dive on a newly discovered wreck off the Northern Queensland coast.

DICKSON COLLEGE RADIO CLUB

Dickson College, in Canberra, runs a registered course in amateur radio as part of its curriculum. The main purpose of the course is to give students an understanding of electronics through the medium of amateur radio.

The school runs its own station, VK1NAT. To use the station without supervision, a person needs at least the Novice Amateur Radio Operators Certificate of Proficiency. The College's equipment includes a modified TS-520S transceiver driving a five band trap vertical ground plane antenna mounted on the roof of the building. This equipment has been installed and is operated by an enthusiastic group of students within the terms of their licence.

One of the long term aims of the group is to become involved in AMSAT amateur satellites. Anyone interested in the Dickson College activities should contact Terry Bevan at the college.

ESANDA FINANCE RALLY OF AUSTRALIA

August saw the Division providing support to the ESANDA Finance Rally. Ken VK1KEN, will report separately on this activity.

COAXIAL CABLE

A limited amount of RG-58 cable is now in stock. Please contact Norm VK1GN, if you are interested.

Unfortunately, due to circumstances which are too unbelievable to explain, we still do not have the RG-213 we hoped to get in July. Oh well, such is life!

BARRY BENNETT

I just don't understand it. Another "old and bold", Barry Bennett VK1BB, has deserted this beautiful climate of Canberra, to go and live on the north coast of New South Wales. Must be a horrible way to go; sun, beaches and a laid-back lifestyle. On behalf of all in VK1-land, good luck Barry and his new wife in their exile to Byron Bay.

ARMY RESERVE

The Canberra-based squadron of 8 Divisional Signal Regiment, an Army Reserve (CMF) unit is looking for recruits interested in part-time military communications.

After initial recruit and trade training, soldiers are posted to positions as radio, com-centre and line operators. Tax-free pay is available for one two-week camp and 28 days made up from evenings and weekends parades. A good opportunity to get paid for operating radios!

The Squadron parades at Alara Street Depot on Thursday nights at 7 pm local time. The contact is Warrant Officer John Pruskocki on telephone number (062) 48 9777 during business hours.

JOHN MOYLE MEMORIAL FIELD DAY 1988

A further reminder that, if you have any suggestions, or wish to participate in the John Moyle Memorial Field Day Contest, please contact Norm VK1GN, phone 54 8412.

ar

VK2 Mini-Bulletin

Tim Mills VK2ZTM
VK2 MINI BULLETIN EDITOR
Box 1066, Parramatta, NSW 2150

VI88NSW — PARRAMATTA BICENTENARY AWARD

To celebrate the 200th anniversary of the founding of Parramatta, the special event station, VI88NSW, will be operating throughout November from 8 am to 8 pm local time on various HF and VHF bands as conditions permit. Details of the operation were given last month in AR as well as on the broadcasts.

Time slots in the final four weeks during December for VI88NSW operation are still available for clubs and individuals. Check with the Divisional Office if you wish to use it. Don't forget to submit your claim for the Fisk Award which operated under the call sign of VI88WIA on September 22. Details were in September AR.

WAGGA WAGGA ARC

The Field Day is the first weekend of November, the fourth to sixth. See details in previous ARs. Contact John VK2JGK direct or via the club address, PO Box 294, Wagga Wagga, NSW 2650

CONFERENCE OF CLUBS

This is being hosted this month by the Illawarra ARS. The date is expected to be Saturday November 12, which is moved from the previous weekend due to the clash with the Wagga Field Day.

TWO-METRE HAND-HELDS

There may be a few of the Alinco ALX-2T hand-helds left. Check details on the broadcasts. These units are available as a service to Institute members for $325 plus $7.50 post and packaging. Applications only accepted if your AR address label is included. See the recent review in *Amateur Radio*.

TRASH AND TREASURE

The last Trash and Treasure for the year will be on Sunday afternoon, November 27, in the Parramatta car park.

The Postcode Contest for this month is two metres simplex FM on Friday, November 25, from 9 pm to 11 pm.

The December Postcode Contest is on six metres on December 20, as part of the Ross Hull Contest. This year is the 50th Anniversary of the death of Ross Hull on September 13, 1938.

VK2 AWARDS

After several drafts, the design has been selected. As usual, further details will be given on the broadcasts. There have been some minor changes to the number of contacts required for the Parks Award. Don't forget the VK2 Bicentenary Award — 200 contacts are required between January 1, 1988 and December 31, 1988. Check you logs, you may already qualify.

NEW MEMBERS

A warm welcome is extended to the following who were in the September intake.

J D Apel Assoc	Orange
B A Clarke Assoc	Birchgrove
G A Coller Assoc	Epping
H C Davison VK2NHD	Wagga Wagga
D W Dawson Assoc	Liverpool
N Deitch VK2ZXC	Port Kembla
C V de Plater VK2PCD	Narrawallee
D Georgievski Assoc	Rockdale
B J Hammond VK2DOM	Mortdale
B J Holmquist VK2BDX	Seven Hills
J D Lodding Assoc	Helensburgh
J M McAlister VK2XFQ	Tamworth
F W Murphy VK2PGS	Chester Hill

VK3 WIA Notes

WIA VICTORIAN DIVISION
412 Brunswick Street, Fitzroy, Vic. 3065

SALE OF VK3 HEADQUARTERS

The WIA Victorian Division's Headquarters building at 412 Brunswick Street, Fitzroy, is to be sold.

This decision, which was made at the Victorian Division Council meeting on September 1, follows more than five years of deliberations on how to make the best use of the Division's biggest asset for the benefit of the members.

The decision is a consequence of the recommendations made by a special finance committee set up last year to consider the various options regarding the Division's property.

Part of the minute from the meeting reads:
" . .the net proceeds be invested in a Capital Guaranteed Security in trust for the Division members. . " and " . . access to the principal be subject to the wishes of a Special Meeting of Division members called specifically for that purpose "

SUNDAY MORNING BROADCAST

VK3BWI broadcasts a news and information presentation at 10.30 am (local time) every Sunday. Several frequencies and locations are used simultaneously; they are as follows

1.840 MHz AM from Lyndhurst
3.615 MHz LSB from Lyndhurst
7.085 kHz LSB via VK3RC near Seymour, and via repeaters
VK3RMM Mount Macedon
VK3RWG Mount Baw Baw
VK3RMA Mildura
VK3RMU Mount Saint Leonard

A broadcast Listeners' Survey was conducted on August 28, and the results have now been processed.

The content and presentation of the broadcast has widespread support, but there have been several suggestions of additional topics that some [illegible].

The return of "DX News" was requested. This matter was already in hand, and it may, in fact, be back on air before you read this.

The possibility of presenting propagation reports is being carefully considered.

Some readers felt that the broadcast was too long, others were pleased to hear so much interesting news.

A few felt that the broadcast promoted the WIA Victorian Division and its services too vigourously. This will be toned down a little.

HF signal reports are encouraging.

Transmission through a multiplicity of repealers seems to be appreciated and plans have already been finalised to extend this network.

As time and resources permit, the broadcast will also appear on six metres and on two metres SSB.

Contributed by Bill Trigg VK3PTW, VK3 Council

NEW MEMBERS

The following applications were received for the month of August and accepted by council on September 1, 1988. A warm welcome is extended to you all.

Leif Andersen	Mulgrave
David Archer* VK3DVB	Glenhuntly
Allan Burcher* VK3NET	Anakie
Robert Burdett* VK3YQR	
Leslie Burr	Montmorency
Trevor D'Ambrosio* VK3TEG	Greensborough
Egbert Ekkel*	Nunawading
Walter Ellingham VK3CWE	Pascoe Vale
Kerry Finn	Sorrento
Brian Gray VK3KMZ	Bundoora
Harold Hardy* VK3EHH	Churchill
Daryl Hughes* VK3VXQ	Delacombe
William Little VK3TAJ	Mount Beauty
Trevor McManus* VK3NHF	Shepparton
Allan Marsland* VK3NY	Mount Beauty
Simon Osborne	Croydon South
Michael Paul* VK3VTA	Lilydale
C A Prasek VK3TDQ	Ardeer
Kris Ross-Soden* VK3IEF	Strathmerton
G P Tremellen VK3TGP	Healesville
Frank Ruzzene	Preston

MURPHY'S CORNER Nov 00

There were five small errors in the "20 Amp Power Supply" article by the Moorabbin and District Radio Club on page 4 of the August 1988 issue of AR.

These are:

1. In paragraph 3, the Mark 3 supply was actually introduced eight years ago, not three.
2. At the bottom of column 1, the resistor is 200 ohm 10 watt, and comprises two 100 ohm 5 watt units in series.
3. The capacitor across the 2k2 resistor from pin 10 of the 723 to ground, is 1.0 microfarad.
4. The capacitor from pins 11 and 12 of the 723 to ground is 1.0 nanofarad (0.001 microfarad)
5. The un-numbered pin, shown grounded on the 723, is pin 7

Five-Eighth Wave

Jennifer Warrington VK5ANW
59 Albert Street, Clarence Gardens, SA 5039

SPEAKER PROBLEM SOLVED

Perhaps it's because we are so close to the source that we don't see the "wood for the trees" (if you will excuse the mixed metaphors). I am one of the first to sing the praises of John Ingham VK5KG and the Video Tape Library Service and yet, when we needed a "fill-in" speaker when Peter Gamble VK3YRP was unable to be with us in July, it was John who gently pointed out to me that this is exactly what the VTL is here for. We are exceptionally lucky in Adelaide, not only to have John able to advise us on the latest tapes "hot off the press" (ours didn't even have a title when John suggested it) but also to have John to volunteer to come and show it and borrow a large screen monitor for us.

However, I would like to hastily point out, that the system works just as well for those of you in the country-areas of South Australia, or interstate. Elsewhere in this issue of AR is a list of videos that are available through John and information on how you may make use of this service. There are over 70 titles now available and if you can't decide on one or more, ask John's advice. I am sure you will not be disappointed.

FEDERAL PRESIDENT NOW AVAILABLE ON TAPE!

At our Club's Convention last April, the guest speaker was our, now Federal President, Peter Gamble VK3YRP. Peter spoke on the WIA, how it works, and where it looked like heading in the 1990s. It was said at the time that it should have been recorded so that it could be shown to the clubs and Peter, agreed to come back later in the year and speak to a general meeting which, at the same time, could be video taped. As I said in the preceding paragraph, we had hoped to have Peter with us in July but this didn't quite work out with his schedule, so we were delighted to have him with us in August. Once again John Ingham was there, but this time it was to record Peter's talk on video. Peter pulls no punches (although there may be a word or two edited!) and the news is not all "rosy" unless we all work towards changing the course in which the WIA and amateur radio seemed to be headed. I hope all clubs and as many individuals as possible, will see this tape. Those of us who care about the WIA (as Peter obviously does) will gain a lot from it. Our grateful thanks to both John and Peter for their time and efforts.

DIARY DATES

Thursday, November 17: Old Timers' Luncheon (also Ladies Luncheon for any interested YLs, whether 'attached' to an Old Timer or not). Contact George Luxon VK5RX or Ray Deane VK5RK for further details.

Sunday, November 20: WIA Picnic (probably at Bridgewater Oval — listen to the Sunday Morning Broadcast for any changes of venue or date). Bring the family for a great day out. Bring your own lunch and the WIA will provide ice creams and soft drinks for all. There will be races for all age groups, doughnut eating contests, water-filled balloons, transformer tossing, fox hunts and a gate prize. In fact, all the activities just mentioned have prizes for the winners.

Tuesday, November 29: Buy and Sell night 7.30 pm at BGB, West Thebarton Road (no ESC, QSL Bureau or Pubs on this night).

Tuesday, December 6: WIA Christmas Social at Woodville Community Hall, 64c Woodville Road, Woodville. Speaker will be Dr Mike Tyler, Reader in Zoology at Adelaide University. "Frog is a Four Letter Word". I understand Dr Tyler is a very funny and entertaining speaker, so don't miss it. We would also welcome any spouses or friends. Please bring a plate of supper to augment the salad platters, pies, pasties, sausage rolls etc that the WIA provides. Tea, coffee, soft drinks, etc, are also provided.

PLEASE NOTE

As there are five Tuesdays in January 1989, and we normally have a Buy and Sell meeting in January anyway, there will be no meeting on January 31. January 24 will be a Buy and Sell night preceded by business. ESC, Pubs and the QSL Bureau will all be available on this night. (But we will endeavour to start at 7.30 pm).

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WA Bulletin

John Sparkes VK6JX
VK6 PUBLICITY OFFICER
83 Anemone Way, Mullaloo, WA. 6025

The Western Australia Repeater Group was founded in August 1975, and accepted for club membership into the WIA in April 1976.

The group was incorporated in 1983, and currently has around 150 members.

The aim of the group is to provide and maintain repeaters for the amateur service in West Australia, including the provision of assistance to country amateur groups in repeater ventures. Examples of the latter are the Cataby and Busselton repeaters.

The group also strives to further technology and systems development in all aspects of repeater design, construction and installation.

The group currently holds 13 licenses, comprising nine operational repeaters, some on "soon to be completed" status, and VK6RRG, the group's own club call sign.

Meetings are held on the third Sunday of every odd-numbered month at the QTH of Gill VK6YL, 47 Belvedaire Way, Lynwood, at 1 pm.

There is also an informal "on-air" meeting on Channel 3 repeater every Sunday morning at 10.30 am — straight after the WIA News Broadcast on the Channel 2 Repeater.

Maintenance or installation work is generally carried out by "working bees" and any assistance provided by any amateurs or friends, other than the very hardworking core members of the Group itself, will be gratefully received.

Subscriptions for the group are minimal, and the committee and members are very proud of the excellent service provided for so many (largely at no cost) by so few.

The Committee is comprised of the following amateurs:

VK6s: MS, YL, LZ, UP, KEG, ZLT, CC, BMW, CU, with VK6MM as patron.

The group planned a much improved AUSSAT/ repeater performance for JOTA this year — no more mute tails and delay problems confusing operators. Despite these problems, last year's performance was so good, that the group linked the Perth repeater (Channel 2) to the Mount William repeater (Channel 6) to extend the coverage of JOTA deeper into the south-west of the State.

The Cataby repeater is now back on the air with new solar panels to replace the cranky-old wind generator. This provides extended coverage north of Perth.

One of the new projects is a repeater destined for Mount Saddleback, near Boddington. This repeater should be accessible from all major south-west centres thereby making WA seem a little smaller! This repeater will also house a digipeater operating on 147.575 MHz — WA's exclusive digipeat frequency.

The group currently has a license for a 29 MHz FM repeater, VK6RHF, which is awaiting construction.

Discussion of the group would not be complete without mention of Will VK6UU, who, with a few others, has traditionally provided technical expertise and ideas for the group. However, Will is always looking for assistance from interested people.

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Over to You!

Any opinion expressed under this heading is the individual opinion of the writer and does not necessarily coincide with that of the publisher

NEW GROUP FORMED

A group of amateur astronomers and space enthusiasts in Sydney have recently formed a group called DAWESSAT (the Lt William Dawes Amateur Space Telescope Project), a group which promises to take Australian amateur astronomy into the Space Age. The group intend to build a small amateur space telescope.

The current design calls for a Cassegrain telescope between 25 to 30 centimetres aperture. It will have two instruments, a black and white television camera and an infrared photometer. The information will transmitted on the amateur radio bands.

Proposed launch date is 1992, The International Space Year, and it is hoped to launch it piggy-back, a milar to the way AMSAT satellites are launched.

For this project to succeed, the support of the amateur radio community is needed. Any radio amateurs who are interested in this project are asked to please contact the writer.

Yours sincerely,
Ralph Buttigieg
Secretary,
DAWESSAT
Inside Mail Box 1768
Seven Hills West, NSW. 2147

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TECHNICAL CORRESPONDENCE

I would like to correct a number of statements made by Ron Mills VK5XW, in his article on page 23, in August AR.

The other article he refers to as having appeared in "a local radio magazine" was, in fact, written by me and appeared in *Amateur Radio Action* Vol 9 No 8, pages 32 and 33. Ron states that the FL-2100 model was not specified — it was. The model referred to in the article was simply the Yaesu FL-2100, the first of the 2100 series and the article was very clearly titled "Improving the FL-2100 on 21 and 28 MHz". No claims were made for the FL-2100B or FL-2100Z as I did not have access to those models. Changes were made during the production run as Ron has found out himself.

Ron states "The author claimed that by replacing the silver-plated wire with coaxial cable the problem had been solved." At no point was any such statement made. To my knowledge the only silver-plated wire used in the FL-2100 is in the pi-coupler coil and I did not mention silver-plated wire. I did mention 16 gauge TC wire which is something totally different (and a lot cheaper!)

After failing to get the results I mentioned, Ron then says "I retraced my steps gradually replacing the SWR bridge and the wiring with coaxial cable only to find it made no difference to the FL-2100B". I made no mention of replacing the internal SWR bridge with coaxial cable and would not have suggested that under any circumstances. I did mention placing a wire bridge (not an SWR bridge) between two coaxial connectors during tests I made which was something quite different.

Having read the text as printed in AR, I can only conclude that Ron did not get the desired result because he either did not follow my description of the modification as I made it or he misinterpreted what was said in the article. My unit operated perfectly satisfactorily after modification. Another VK3 operator made the same changes to his FL-2100B and achieved even more spectacular improvement in output than I did. I would suggest that Ron reads my original text again carefully to ensure he understands exactly what I said.

Yours faithfully,
Geoff Wilson VK3AMK
7 Norman Avenue
Frankston, Vic. 3199

ar

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ADDED BALANCE. . .

"There are still amateurs who use balanced feeders" states Dean VK5LB, in his *Discussion on Open Wire Feeders and Balanced Output Antenna Matchers*.

With this assertion I agree wholeheartedly. I am one of many who have weighed the benefits to be had from using such a system and have embraced it. Most of the features Dean reviews are correct, especially the very low losses associated with parallel lines but he errs somewhat when he strays from the pronouncements of M Walter Maxwells' W2DU/W8KHK, *Another Look at Reflections*.

VK5LB states. .

1. Conjugate matching — So, even with high VSWR figures, there need be no loss of any power if the antenna system is tuned to the impedance required by the transmitter.

This may be the case if 'Superconductors' are used in the transmission line, however, precluding this, there must be IR losses. These losses are more pronounced the greater the VSWR existing as the result of impedance mismatch between the line and the antenna. The conjugate match serves only to send back to the antenna the reflected power resulting from the previously mentioned mismatch. An oscillation of reflected and re-reflected power continues indefinitely until part of the power is eventually radiated and the rest is consumed as heat as it travels to and fro.

2. Dean's G5RV antenna uses ladder line from the centre insulator right down inside the shack to a balanced output matcher.

His G5RV ceased to be a G5RV the moment he fed it with anything but coaxial line! The theory behind the G5RV is that the dipole section functions as three halfwaves in phase on 20 metres and the 300 ohm section acts as a halfwave current phasing stub, the impedance at the end of which should approximate 75 ohms. What VK5LB has is a simple dipole fed with balanced line. As he states by quoting the *ARRL Handbook*, "A wire antenna, fed at the centre with open wire line is the most efficient multiband antenna devised to date."

3. Rotatable beams are more conveniently fed with coaxial line for obvious reasons.

I have fed both Yagi and quad beams with balanced lines for over 20 years and I am yet to discover any obvious reasons for doing otherwise.

4. The open wire line at VK5LB is simply laid out in the same way as coaxial cable.

This practice can cause public relations problems. Balanced lines must be isolated from large metal objects such as spouting, towers, etc, by about 15 centimetres (six inches) if imbalance is to be avoided. Imbalance on parallel feeders causes them to radiate.

This will almost certainly unbalance your neighbour's temper when you interfere with his television viewing . . ditto your spouse! ! !

5. For open wire lines to be used to feed rotatable beams, a halfwave section of coaxial cable may be used as a balun to provide 1:1 or 4:1 ratios. Coaxial baluns are frequency sensitive ad respond mainly to the frequency for which they are cut, attenuating all others.

Earlier in his article, Dean dismisses the use of broadband baluns for several erroneous reasons, one of which was that their bandwidth was too restricted. Now he praises the very feature he previously rejected. The line matching network and balanced lines will exhibit low losses compared to coaxial cable despite quite high VSWRs but there is no excuse for beginning further behind the starting blocks than is necessary. A broadband transformer wound on a toroidal ferrite core, (see *RF Impedance Matching Using Ferrite Toroidal Cores* by VK3HK. AR August to December 1988) will provide ratios of 9:1 and 16:1 easily over a range from 14 MHz to 30 MHz which will more closely match the feed impedances of 35 ohms and less of multi-element Yagis when fed with 300, 450 or 600 ohm lines. They will be far less expensive and a good deal less cumbersome at the top of the tower.

From this, it would appear I am knocking Dean and his suggestion of using balanced feeders. I am not! I look forward to his project on the Z-match and I thoroughly recommend members of the Institute take advantage of our library and read Maxwells *Another Look At Reflections*, *QST* 1973, 1974 and 1976.

Stephen Bushell VK3HK
74 King Parade
Knoxfield, Vic. 3180

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WHAT IS THIS AMATEUR RADIO BUSINESS?

The other day I stopped at a service station for fuel. The service station attendant noticed my commercially-built HF transceiver in the rear of the car. I answered his query with the comment "That's just a bit of amateur radio gear". He replied "Doesn't look too amateurish to me!" In an instant he had highlighted one of the fundamental problems facing our hobby.

In the 'amateur radio' context the word amateur is often interpreted as inferior-unskilled. The range of skills our members possess is no less than that found amongst athletes, and yet, who would describe Olympic athletes as unskilled? They are most certainly amateur only in the unpaid sense — not in the skill sense. What about those unpaid pilots who share the skies with their commercial counterparts? They are not called amateurs, theirs is a 'private' pilot's licence.

Do we need to change either our name or our image? The answer is undoubtedly *yes*. As the term "amateur radio" is well established we had best look at our image. Whenever others think of amateur radio they should be able to associate it with an image of operational or technical skill. Others not only means the public but also those organisations we deal with. Does the Department of Transport and Communications regard us in a more or less favourable light than our commercial counterparts? What about the Police and SES? Are we a resource to be relied on in an emergency or do they think of us as a "bunch of amateurs"?

If amateur radio is to survive into the next century we had best ensure that those who can influence our survival think favourably of us.

73,
Duncan Raymont VK2DLR
Booyong, NSW. 2480.

ar

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TOWERS

The letters of David VK2PGE (April 88 AR) and Neil VK6NE (August 88 AR), regarding tower problems, are interesting.

Living away from urban areas has advantages when it comes to erecting radio towers. But we have not escaped humbug.

As application to establish a community communications facility on the only viable site in this area has been stifled by the environment lobby. Talk to any communications planning engineer and you will hear similar tales of woe. Government recognises our more obvious and pleasing natural

resources but no such recognition applies to the identification and development of superior communications sites. Radio-users are, as yet, a disorganised lot.

On the urban scene, our WA Division is locked in battle with Local Government. The outcome will depend heavily on the quality of evidence and legal precedents. I am unaware of any serious attempt by our Federal body to co-ordinate and document evidence justifying amateur radio, and in particular, explaining the need for the physical character of antennas and their supporting structures. The published report of the Victorian Parliamentary Committee on Radio Masts, containing the VK3 submission, is a good attempt, but needs considerable improvement.

Despite all of this, it seems unlikely that legal challenges of Local Government actions will do more than line the pockets of lawyers. The less costly complaint to the Ombudsman, may also be unrewarding. The fact is, that to non-radio-users, towers are not a thing of beauty. We should look for an alternative solution.

David's wind-up tower has possibilities but the non-linear rate of feed needed to keep the guy wires taut as the tower rises poses daunting engineering problems. A hydraulically operated tower with a rotatable base would have several advantages. Whatever method is used, it is certain that changing times and attitudes will condemn those permanent residential area towers. Fighting your neighbour and not your problem is no way to negotiate.

I support David's plea for WIA encouragement of resourcefulness in this area.

Yours faithfully,
Graham Dun VK2DMA
"Bonnie Brees"
Wattamondara, NSW. 2794

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PACKET NETS [1]

AR August 1988, arrived today and I noted the WIA Bulletin paragraph headed *Packet Radio — Harmful interference was experienced by the Travellers' Net from unmanned (mostly) packet radio stations*.

Could the opposite case be considered? I believe that no one person or group has a prior right to any frequency in the amateur service except WIA Official Broadcasts plus Beacons and Repeaters.

It is considered gentlemanly to listen — and/or inquire if the frequency is being used before transmitting. This inquiry is heard frequently on many frequencies used by the amateur service.

You may wonder why I write from New Zealand on this matter — Twice in the last two weeks I have been listening to Packet and try and see how it operates, while working on the car. (Saves spending money on repairs!). The particular frequency was in use when lo and behold, the "Travellers' Net" appeared on the frequency without a hint of the usual courtesies or regard for the then present users. Would this too be classed as harmful interference, particularly by the Packet stations?

I am not a Packeteer at the moment — the only digital modes here are CW and RTTY on VHF, so one day I may join the race.

Yours faithfully,
Ian Henry ZL1BKZ
27 McRae Road
Mount Wellington, Auckland 6, NZ.

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PACKET NETS [2]

After reading the continual barrage of mail on Packet Radio and the Travellers' Net, published in *Amateur Radio*, I am totally "fed up" with reading most of the childish nonsense sent in by the perhaps ill-informed Travellers' Net supporters.

They give the impression that they are going to make all stations, regardless of mode of operation, move to other frequencies so they can run their precious net. What a hide! What is more, they had been operating their net in what was until recently a narrow band and wide band modes section of the 20 metre band without giving a hoot about RTTY or Packet operators, (the Gentlemen's' Agreement was changed in 1987). In fact, they have even lobbied the WIA Federal Executive to approach DOTC about stopping the interference. What cheek! Also in the WA Bulletin (August 1988 AR) they refer to the "harmful interference" from "unmanned (mostly) packet radio stations" and the "ungentlemanly behaviour of the Packeteers" (tarring us all with the same brush). Well that was the last straw as far as I am concerned.

Perhaps one of the Travellers' Net types can give answers to the following:

1. How is it that if packet signals are heard on a certain frequency it can then be declared by SSB operators to be not in use allowing them to use it?
2. How is it that if packet signals interfere with SSB signals that it becomes "harmful interference" but if SSB interferes with packet that is just hard luck?
3. How is it that a packet station operating on 14.103 MHz USB (the common frequency for unattended bulletin boards and for world-wide auto-forwarding) can interfere with SSB stations on 14.106 or 107 MHz USB?
4. If the world-wide packet auto-forwarding network operated on a particular frequency, why is it that Australian amateurs providing the same service (to ALL AMATEURS) shouldn't be permitted to use that frequency?
5. If 20 metre SSTV and FAX operators (many of who are packeteers) can have specific call frequencies, why can't packeteers?
6. How is it that a minority group, running a small net for one hour a day, seems to overshadow the 24 hour a day world-wide auto-forwarding of: details of transceiver modifications, computer programs, satellite information, astronomy information, propagation reports, antenna designs, requests for help, reference projects and modifications, etc, personal messages, ARRL news, WIA news, NZART news, RSGB news, AMSAT news, details of the latest amateur discoveries, educational material, data collected by schools related to satellites etc, details of emergency procedures, welfare messages to and from disaster areas, DX news (SSB, CW, RTTY and Packet), moonbounce details and even amateur jokes for the education of *all amateurs*? Much of this information is used in amateur news broadcasts and newsletters, too.

So, you see, there is another side to the argument. Yes, I do operate packet, (so I am biased), and AMTOR, RTTY, SSB and CW and I am getting sick of having my intelligence insulted by the utter rubbish contained in some letters of recent times. The amateur radio spectrum is meant to be shared, not fought over or carved up and certainly not to be controlled by a small group of indignant net operators.

We are supposed to be an adult, self-governing (well almost) democratic body (the WIA) presenting a united front to all opposition towards amateur radio but, instead we are squabbling like spoiled children who don't know how well off we are in this modern world. Stop all this childish nonsense that is degrading our standing with Government bodies and the electronics industry and start working together for the good of our hobby.

[redacted]
14 Grant Close
Coffs Harbour, NSW. 2450

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PACKET FEEDBACK

We have read with interest the paper from Barry VK2AAB, concerning Packet Radio Bulletin Boards. At the outset, we would like to commend Barry for the comprehensive and factual presentation of the realities of the Packet Bulletin Board scene in Australia today. The Publications Committee should also be commended for publication of the paper and thus encouraging discussion on this topic.

The ACT Packet Group is in agreement with the recommendations made by Barry and wishes to contribute the following thoughts to discussion on this subject.

In the matter of message forwarding on HF, we see merit in greater use of the 10 MHz band. This band is ideally suited for regional distribution and has been designated a narrow modes only band by the IARU. Transfer of traffic to this band reduces demand for 14 MHz band space. Because of its general narrow band nature, this band is ideally suited for experimentation with PSK and other techniques for reliable 1200 Baud HF operation which can further reduce demand for spectrum requirements.

Analysis of VHF Packet traffic in the Canberra region shows a large number of Bulletin Board connect attempts via several repeaters. Thus it is apparent that a proportion of Packet operators are "BBS DXing" and this leads to congestion on the few designated Packet frequencies. One wonders why this practice continues when the same information is frequently available on Bulletin Boards closer to the Operator.

We would recommend that BBS Sysops restrict access to their BBSs to connects via no more than three digipeaters. This should adequately accommodate those operators who are geographically isolated from a BBS. Many BBSs, especially those in large population areas, could provide an appropriate level of service through two digipeaters or less.

Of the BBS traffic which is observed from the Canberra area, very little is Packet orientated. This creates the question, why aren't BBSs being used for the dissemination of technical and news items relating to packet radio. They would seem to be ideally suited for this purpose. Furthermore, the quantity of material appearing on these BBSs which is not even amateur radio orientated is disturbing. We would recommend that originators of Packet Radio messages take greater care with the addressing and content of messages to ensure that they are distributed no further than is necessary and that their content has some relevance to amateur radio. We would further recommend that Sysops be encouraged to cull inappropriate messages from their systems.

We observe with regret the marked decline in QSOs between people. We surmise that among the causes of this are:

— Inappropriate usage of Bulletin Boards leading to congestion of packet channels.

— Inappropriate usage of length beacons, often digipeated, as a CQ call while the station is unattended. In the mature state of the Australian Packet Network, beaconing is entirely inappropri[redacted]

Are there too many BBSs in Australia? A quick count reveals over 30 BBSs for an estimated population of less than 1000 packet operators. Compare this with a typical computer club with 500 paying members which will have one telephone BBS. Obviously a number of geographically dispersed BBSs are needed to cater for the packet population. However is there a need for more than one general BBS in the larger population centres? We heartily endorse Barry's recommendation for State co-ordination of the BBS network.

In discussion the Group asked itself, what was the purpose of Packet Radio BBS Services? Is it to:

1. Disseminate information to amateurs, or
2. Promote part of the growing area of our hobby, packet radio?

If it is the former then could this be better achieved by an open access telephone based BBS

network which could reach a much greater proportion of the amateur population. If it is the latter then an examination of the content of BBS messages indicates that this is not being achieved.

The ACT Packet Radio Group will shortly be disturbing a survey to determine where the amateur population thinks packet radio is heading. We undertake to publish the results in AR and welcome your involvement in this survey.

Carl Makin
On behalf of the ACT Packet Group
5 Lockwood Street
McKellor, ACT. 2617

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WE NEED A STANDARD

I regret to have to write and complain about the following ongoing problem in the operation of contests conducted by various States.

It would appear that the people conducting these contests cannot get their act together. In particular, I quote the recent Remembrance Day Contest.

In last year's contest the numbers required were of three digits such as "001". Many people with computers went to much trouble to type-up a computer program published in AR before the contest last year. Although almost unreadable, due to the poor quality printing, they eventually had excellent results. But, this year the rule-makers decided to include an extra RS/T number before the score number. With my limited knowledge o programming, it was not until 3.30 am on the Saturday morning that I was able to get the complicated program to comply with the new rules. The organisers apparently had no thought for the inconvenience caused to many who use their computer to keep track of the entries and print them out leg bly for checking.

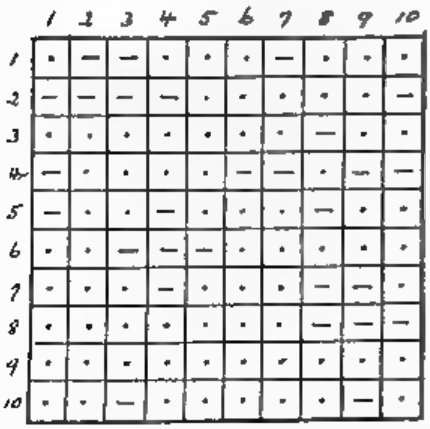
It is requested that the WIA lay down a standard for these Australian contests so that the many people why use computers to assist them in compiling and reprinting their logs, may not be inconvenienced in this way again!

Yours faithfully,
Alf Hansen VK4OL
161 Raymont Road
Aderley, Qld. 4051

ar

Solution to Morseword 21

Across: 1 pus 2 onset 3 hire 4 bay 5 nail 6 ugh 7 VIP 8 ESSO 9 hies 10 user
Down: 1 apse 2 miss 3 gust 4 rams 5 hens 6 vies 7 tides 8 urge 9 stunt 10 arid



FAULTY BATTERY CHARGERS COULD KILL

A fault in a certain type of battery charger could result in severe shock causing death.

The State Electricity Commission of Victoria (SECV) said a middle-aged man died while using a 40 amp Vane battery charger, model 2200, Power King.

An SECV investigation found the internal mains voltage connections to the charger's transformer had contacted part of the metal rectifier that was connected to the battery charging circuit.

This fault causes 240 volts mains potential to appear on the battery charging leads.

The charger had been made between 25 and 30 years ago by the Vane Electrical Instruments Company, Sydney, which is no longer in business.

The SECV said the charger should not be used until inspected and if necessary, repaired by a qualified electrical serviceman.

Details on the modifications required to ensure safety may be obtained from the SECV by telephoning (03) 691 4470.

—Photograph courtesy State Electricity Commission of Victoria

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SUBSCRIPTION REMINDER NOTICES

As from now, only one membership subscription notice will be forwarded to members each year.

A reminder notice will not be sent!

As from now, only one additional issue of *Amateur Radio* magazine will be sent to you if your renewal subscription is not received.

Not two additional issues as in the past!

Only a small number of *Amateur Radio* magazines are now being printed each month surplus to members requirements. This means that if you do not renew your subscription on time, you may not be able to get your missing copies of AR!

WHEN YOUR MEMBERSHIP RENEWAL IS DUE, PLEASE PAY PROMPTLY AND ENSURE CONTINUAL RECEIPT OF *AMATEUR RADIO* MAGAZINE!

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Silent Key

It is with deep regret we record the passing of

MR KEN KELLY VK2MJ

Obituaries

MELVILLE JACK DEW VK5JX

It is with deep regret that I inform all amateurs of the passing of my father Jack VK5JX, on July 23, 1988, aged 77 years. He will be sadly missed by all.

The year 1923 saw Jack building his first crystal set at the age of 11, having left school the previous year. Parts for this crystal set were purchased from the local chemist, who displayed radio parts in the window of his shop. During these early years, Jack was tutored in radio theory and Morse by Merve Brown VK5MB, but due to his lack of formal education, Jack was not able to pass the examinations and so lost interest in amateur radio.

He was self-employed for most of his life, starting as a self-taught cobbler, who later manufactured children's shoes. When television appeared Jack gradually changed over from shoe manufacturing to television repairs and again studied for his amateur licence. He gained a pass in June 1959 and was issued with the call sign VK5JX.

An active interest was taken in the SA Division functions and for some years Jack helped put the SA Division Sunday Broadcast to air. A major heart operation in 1979 stopped him from continuing this task.

One of Jack's hopes was to see me (his son) become an amateur and this must have been one of the highlights of his life. Many happy contacts over the last three years were made.

Vale Jack, loving husband, father and friend.

Robert Dew VK1DE
ar

HAROLD L WRIGHT VK2AWH

Harold was tragically killed in Sydney on July 13, 1988, when he was struck by a motor cycle whilst crossing the road.

Harold was born in 1929 and grew up in the Grafton area. He gained his early trade training in civil aviation and then joined the technical side of the PMG's Department. He moved to Lismore in 1962 to become Maintenance Technical Officer on the then new Broadband Radio Communications link system. He remained there, changing with and usually ahead of the technology of the systems. He was often involved in the setting up and development of new equipment and systems.

He was a very caring family man with four children who were always his prime concern. Family and electronics were Harold's life!

In 1970, he was seconded to the Australian Antarctic Division and was at Heard Island for a year. It was natural that amateur radio would become an interest. Harold gained the call sign VK2AWH and was very active in the experimental and construction side of radio. He joined the Summerland Amateur Radio Club in 1962 being Secretary from 1974 to 1979 and involved in framing the Club's new Constitution in 1975. For many years club meetings were held in Harold's garage-cum-shack until growing numbers made it impracticable. He was also an active member of the WIA.

Harold coached many budding amateurs. He supported the establishment of the Lismore repeater VK2RIC, which he worked on for several years prior to its inauguration in 1977. Although assisted by others, he was mainly responsible for its construction and maintenance until his death. He also principally built and serviced the UHF repeater, VK2RSC.

Harold was very active in WIA matters, especially if he thought that things were not as correct as possible. He represented the club at conferences and AGMs and always returned with a very detailed report of the proceedings for members.

A keen and meticulous constructor, Harold made much of his equipment. When computers appeared Harold built his own which is still in operation. He also made ancillary bits, drives and modems, etc. He was equally involved in his church and civic affairs. He was awarded a Telecom award for work done during the April floods only two days before his untimely death. Amateur and civil radio communications in the area will be the poorer for his passing.

Sincere condolences are extended to his wife Nola, and family.

John Alcorn VK2JWA, on behalf of Summerland Amateur Radio Club
ar

SIDNEY JOHN MONTGOMERY VK2CSM

Sid passed away on June 17, 1988. He was well-known and had many friends amongst the amateurs with whom he had regular scheds over a wide area.

His interest in radio went back to the war years when he was trained in Canada as a Flying Wireless/Navigator. From a class of 180 he graduated third. He was promoted to the rank of Flying Officer. Sid saw service in Malta, Italy, Algiers, Gibraltar and the middle East in a variety of aircraft including Wellingtons, Beaufighters, Liberators, Beauforts and Dakotas. He was discharged, with a mention in dispatches in 1946.

With a young family, and resident near the city, friends introduced him to sailing. After a succession of sail boats, they moved into power boating. This brought out his knowledge of radio when he joined the Pittwater Coastal Patrol. They supplied an amateur, radio-based marine emergency service for the area at a time when 27 MHz was not yet popular.

Moving to Evans Head 16 years ago, it came to Sid's attention that the North Coast of New South Wales was not covered by an integrated marine radio service. His son Geoffrey said: "It was his vision to see the entire coast made "safe" with comprehensive radio cover. He realised has vision through contact with the Coast Guard in Sydney along with many trips, phone calls and letters. His energy was rewarded with the founding of Flotillas at Yamba, Evans Head and Ballina."

"Amateur radio became prominent in his life at this time also. The interest to get into "real radio" was kindled through his friendship with Doug Bowie VK2DU. The novice call came easily, especially the Morse. Three tries at the full call theory realised another dream for him. When he finally got this, there was no doubt, many "radio coaches" gave a sigh of relief! They would be able to get back to higher frequencies not VK2CSM could join them. The antenna farm grew, the world came in and friendship grew in radio," Geoff said.

Sid joined the Summerland Amateur Radio Club in 1986 and enjoyed the support and friendship. He also supported the Club and donated surplus equipment for use and sale.

Deepest sympathy is extended to his wife Sheila, and sons Kenneth and Geoffrey.

Max Reid VK2KJR, on behalf of the Summerlands Amateur Radio Club
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IONOSPHERIC SUMMARY

The IPS and Radio Space Services summary for July contains the following details.

Monthly values were
10 cm flux — 153.4
Sunspot number — 112.6
A Index — 10.7
I Index — 46.8
Flares — 13

Solar activity was moderate in July with 13 M Class Flares being observed. The main periods of increased activity were July 7-13, 24 and 25, and 29 and 31. Despite the frequent solar flares, most were small and would have little effect on HF communications. The largest flares during the month were the M4 flares observed on July 8 and 31.

The daily 10 cm flux values during the month were consistently high, the highest value for the month being 193 on July 1. This is the highest daily value since the start of the new solar cycle. The lowest values of the flux during the month was 133 reached on July 9, and again on 12. The monthly averaged 10 cm flux and the monthly sunspot number were both the highest this solar cycle. The high sunspot numbers during the last two months caused the yearly average sunspot number for January 1988 to surge to 58.2.

Flares and fadeouts for the month occurred on July 2, 7, 8, 9, 11, 13, 24, 25, 29, 30, and 31. On July 7 and 8, there were two flares.

On July 11, the geomagnetic field was at active to minor storm levels during the middle part of the day. On July 16, the field was at active storm levels during the day. July 21 to 23, the field became disturbed after 0300 UTC on July 21, and was at storm levels throughout the rest of the day. The period 0600 to 1200 UTC was especially disturbed. The storm continued into July 22, and weakened on July 23. On July 26, the field was active to minor storm levels from around 0900 UTC. Geomagnetic activity was again low in July with only three days on which the magnetic A index exceeded a value of 20. These were July 11, 16 and 21, with July 21 the most disturbed was an A Index of 27 and a very disturbed period between 0600 and 1200 UTC.

Levels of magnetic disturbance are as follows: 0-7 quiet, 8-15 unsettled, 16-24 active, 25-35 minor storm, 36 and above major storm level.

The ionospheric I ndex is a measure of the average level of the ionospheric critical frequencies available on a particular day, the higher the value of the I index, the higher the ionospheric critical frequencies, and MUF on HF circuits, for that day. The I ndex is most applicable to HF circuits with reflection points in the Australian region. The higher the I ndex, the higher the ionospheric critical for that day.

FLARES AND FADEOUTS

Solar Flares

The most spectacular causes of geomagnetic effects are solar flares. These emit electromagnetic radiation over a wide band of wavelengths ranging from the Xray region of the spectrum right down to the radio region. Visible flares are routinely observed by solar optical observatories and also by solar radio observatories. These observations are usually made from ground-based observatories. However, fares can also be observed by satellite-borne instruments, particularly those sensitive to Xrays which do not penetrate the atmosphere of the Earth. It is very convenient to class flares by their brightness at Xray wavelengths. Two classes of energetic flares are defined. These are

1. *Class M Flares*: have an Xray power between 0.01 and 0.1 ergs/sqcm/sec.
2. *Class X Flares*: have an Xray power of greater than 0.1 ergs/sqcm/sec.

In general, X class flares are quite likely to have a geomagnetic effect on the Earth. M class flares might have a geomagnetic effect, depending on other factors.

Shortwave Fadeout

A solar flare can, if it is energetic enough, indirectly cause an attenuation of shortwave radio signals in the sunlit hemisphere of the Earth. This is known as a fadeout and is caused by increased ionisation of the Earth's ionosphere by the Xrays associated with the solar flare. Because the Xrays travel from the sun to the Earth at the speed of light, the shortwave fadeout will occur at the same time as the flare is observed. Normally, fadeouts will occur for any M or X class flares, although the range of frequencies affected by the fadeout depends on the energy of the flare and the position of the sun in the sky at the reflection point of the shortwave signal. Very energetic flares, such as X class flares, may "produce" a fadeout at all frequencies in the shortwave band. Flares of lesser energy may produce a fadeout at the lower frequencies only. During a flare, the lower shortwave frequencies are the first to be affected and the last to recover. Fadeouts are observed only on circuits which have a reflection point in the daylight hemisphere of the Earth at the time of the flare. The most severe fadeouts are likely to occur when the sun is close to vertically overhead at the reflection point of the signal. No fadeout is observed for circuits which have reflection points only in the night hemisphere of the Earth, even during the most energetic flares.

GEOMAGNETIC DISTURBANCES

In addition to the emission of electromagnetic radiation, a significant solar flare will also cause a large number of charged particles to be ejected from the surface of the sun. If these reach the Earth they can cause a disturbance to the ionosphere. This can have the effect of both disrupting shortwave communications and also causing a geomagnetic storm. Those storms which are caused by an impulsive event such as a solar flare often begin with a sudden commencement. This is an abrupt change in the magnetic field of the Earth. The field which was previously steady becomes quite variable after the sudden commencement. The magnetic storm this initiated usually last 1-2 days.

Because the charged particles which produce the storm take some time to travel from the sun to the Earth, a geomagnetic storm produced by a flare will start well after the flare. This delay is usually 1-2 days.

Geomagnetic storms may be produced by effects other than solar flares. The most important other source are coronal holes, which are extended regions of low density and temperature in the solar corona. These are sources of fast solar wind (ie, streams of charged particles). If the coronal hole is favourably located on the sun, these charged particles can reach the Earth and cause a geomagnetic storm. Coronal holes can be long-lived, often lasting several rotations of the sun (each rotation is 27 days). This regularity makes it often possible to forecast coronal hole-induced storms with a reasonable degree of accuracy up to 27 days in advance.

IONOSPHERIC DISTURBANCES

A geomagnetic disturbance can be accompanied by a disturbance to the ionosphere of the Earth (an ionospheric storm). Long distance shortwave communications rely on the ability of the ionosphere to reflect these radio waves back to the Earth and so any disturbance to the ionosphere will probably alter the range of frequencies in the shortwave band which will be reflected on a particular communications circuit. A convenient manner by which disturbances to the ionosphere may be classed is to consider the effect of the disturbance on the maximum usable frequency (MUF) on any particular circuit. The MUF is the highest frequency on the circuit which will be reflected by the ionosphere and during a disturbance the MUF can be higher than the normal values or, the MUF can be lower than the normal value. The Solar Geophysical Summary lists those days for which typical MUFs differed from the IPS predicted values (either the monthly prediction or the weekly predictions). The effects of a disturbance can depend significantly on the location of the reflection point in the ionosphere, particularly on the latitude of this point. In general, circuits using reflection points at higher latitude are more likely to be significantly affected by disturbances then circuits using low latitude reflection points only. The comments in the Solar Geophysical Summary pertain to ionospheric reflections over Sydney and will not be completely applicable to other locations. Nevertheless, a disturbance in Sydney indicates that other circuits are also likely to be disturbed, particularly higher latitude circuits.

IPS WARNINGS AND ALERTS

IPS issues warnings of impending geomagnetic activity, ionospheric disturbances, likely shortwave fadeouts, etc. The Solar Geophysical Summary lists all IPS warnings issued during the month and the time at which the warning was issued. IPS occasionally issues separate warnings to communications customers and to geophysics customers. Most warnings however go to all customers. If a separate warning was issued, this fact is noted in the Solar Geophysical Summary.

IPS also issues alerts of large solar flares or of disturbances to the geomagnetic field or the ionosphere. The type of alert, together with the date to which the alert was applicable, is listed in this section.

SOLAR FORECAST

This is a brief prediction of solar activity for the month ahead. The prediction is made by examining the past history and likely evolution of solar sunspot groups. Because of the difficulty of making this type of prediction it is usually expressed in general terms, eg, "low", "moderate", "high" etc.

GEOMAGNETIC FORECAST

This is a prediction of the dates in the month ahead on which geomagnetic disturbances can be expected. A prediction is also made of the most likely quiet periods during the month. These predictions are based on an examination of any recurrent storms present during the last few months.

FURTHER INFORMATION

A recorded telephone message giving the latest Solar Geophysical information can be reached by telephoning (02) 269 8614.

—Compiled from data material supplied by IPS Radio and Space Services

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HOW TO JOIN THE WIA

Fill out the following form and send to:

THE MEMBERSHIP SECRETARY
WIRELESS INSTITUTE OF AUSTRALIA
PO BOX 300
CAULFIELD SOUTH, VIC. 3162

I wish to obtain further information about the WIA.

Mr, Mrs, Miss, Ms: .....

Call Sign (if applicable): .....

Address: .....

.....

State and Postcode: .....

DEADLINE FOR JANUARY IS NOVEMBER 7, 1988

HAMADS

TRADE ADS

AMIDON FERROMAGNETIC CORES: Large range for all receiver and Transmitting Applications. For data and price list send 105 x 220 millimetre SASE to **RJ & US IMPORTS**, Box 157, Mortdale NSW 2223. (No inquiries at office please 11 Macken Street, Oatley). Agencies at Geoff Wood Electronics, Lane Cove, NSW. Webb Electronics, Albury, NSW. Truscott Electronics, Croydon Vic. Willis Trading Co, Perth, WA. Electronic Components, Fishwick Plaza ACT.

RADFAX2: Hi-Res radio facsimile Morse & RTTY program for IBM PC/XT on 360K 5.25" floppy + full Doc. Need CGA input port, SSBhf FSK/Tone decoder. Has re-align auto-start view save print. Also "RF2HERC" same as above but suitable for Hercules card and "RF2EGA" for EGA card (640X350 mode). Programs are $30 each + $3 postage ONLY from M Delahunty, 42 Villiers Street, New Farm, Qld. 4005. Ph (07) 358 2785.

WANTED — ACT

MORSE KEYS: Straight & Semi-automatic bug. John VK1AK. Ph: (062) 86 2538 AH, (062) 70 2802 BH.

POWER TRANSFORMER: Type T6GM for Uniden tcvr Model 2020. Price & condition. All expenses paid. Radio Service Manuals or Circuits early Aust sets 1940-1970s for my collection. All expenses paid. Jock VK1LF, QTHR. Ph: (062) 86 6920.

WANTED — NSW

ANY INFORMATION: on a signal generator ADVANCE made by Advance Components, type no 84, 85, 100 kHz to 30 MHz, handbook or photocopy or any information. Pay all costs. A Walsh L20181, 22 Ascot Road, Bowral, NSW. [illegible].

HANDBOOK & CIRCUIT DIAGRAM: for Icom IC-22A. Will pay photocopy & postage costs. Also repeater channel crystals for IC-22A. Peter VK2TE, PO Box 582, Artarmon, NSW. 2064. Ph: (02) 887 2709.

LINEAR AMPLIFIER: suitable for use with TS-520S. Also large HF beam & rotator. W Senior VK2WS, QTHR. Ph: (067) 75 2158.

TOWER: to 40 feet to suit Hy-Gain beam antenna. Please call Tony. Ph: (02) 698 8566 BH, (02) 489 3312 AH.

WANTED — VIC

COLLINS KWM2 ACCESSORIES: 312B4 or 312B5 consoles, 302C-3 watt-meter, DL-1 load, 351R-1 & 2 racks, MM-1 & SM-3 microphones, valves & handbooks (incl KWM2/2A). David VK3BFB. Ph: (03) 587 1593.

[illegible] TR2200, Carphone 25M/22, and A510 (Z1/TSE(W) 8522 2-10 MHz ex DTD. Copying & Freight charges gladly paid. Simon Osborne. Ph: (03) 725 5969.

[illegible] ing details of valve testing conditions, etc. Peter VK3KAU, QTHR. Ph: (03) 744 2570 AH, (3) 338 3300 BH.

WIRING DIAGRAM: for Yaesu receiver FR-50. Will pay for copying. A Luciani, Lot 1 Stanley Road, Stanley, Vic. 3747. Ph: (057) 28 6540.

WANTED — QLD

ANY OLD WIRE & WIRELESS TELEGRAPHY EQUIPMENT & old handbooks or instruction manuals for the above. Private collector Fred VK4NMA QTHR. Ph: (07) [illegible].

AR-7 RECEIVER COIL BOXES: Also Model 14 typing reperforator with keyboard. State price, condition. VK4CB, QTHR. Ph (07) 202 6566 AH (07) 377 9474.

CW FILTER FOR FT-101Z: Also following new valves. 12BY7A & 6146B. Contact Jim VK4CBU, 10 Courageous Court, Scarborough Qld 4020. Ph: (07) 203 4355.

WANTED — WA

SELSYN MOTORS: Master & Slave for beam direction indication. VK6ED, QTHR. Ph: (097) 52 1173.

FOR SALE — ACT

ICOM IC-4E 70CM H/H $250. Yaesu FT-203R 2m h/h $300. Microwave modules MMT 28/144 2m to 10m xvtr $100. Tokyo Hy-Power HL-200E HF RF amp $200. AEA isopole 144Jr $50. DSE VZ-200 with RTTY module — offers? Two packet modems, suit Commodore 64 user port — offers? Colin VK1COL. Ph: (062) 96 1232.

FOR SALE — NSW

BRIDGESTONE 25 WATT 144 MHz TCVR: C/W with folded dipole ant. AC power supply, mic. $400 or reasonable offer. John VK2ANX, QTHR. Ph: (02) 638 4191.

COMPLETE YAESU STATION: comprising FT-902DM tcvr, YO-901 multiscope, FC-902 antenna tuner, YP-150 dummy load-wattmeter, SP-901P phone-patch loudspeaker, FRG-7700 receiver, origina. cartons & operating manuals, operating table & chair, 18AVT Hy-Gain vertical antenna, 60 feet coaxial lead-in cable. Leo Cohen Simplex Auto-key, Simpson voltmeter. All in good condition. $3000 ONO the lot. Harry VK2HV, QTHR. Ph: (02) 958 6567.

PLEASE NOTE: If you are advertising items FOR SALE and WANTED please use a separate form for each. Include all details, eg Name, Address, Telephone Number (and STD code) on both forms. Please print copy for your Hamad as clearly as possible.

* Eight lines free to a WIA members month line for name and address. Commercial rates apply for non-members. Please enclose a mailing label from this magazine with your Hamad.
* Deceased Estates: The full Hamad will appear in AR, even if the ad is not fully radio equipment. (A courtesy note will be forwarded that the ad has been received and will appear in issue of AR.
* Copy in typescript or block letters to PO Box 300, Caulfield South, Vic 3162
* QTHR means address is correct as set out in the WIA current Call Book

Ordinary Hamads submitted from members who are deemed to be in the general electronics retail and wholesale distributive trades should be certified as referring only to private articles not being re-sold for merchandising purposes.

Conditions for commercial advertising are as follows:
$22.50 for four lines plus $2.00 per line (or part thereof)
Minimum charge — $22.50 pre-payable

Copy is required by the Deadline as indicated on page 1 of each issue.

Hamads

STATE: .....

MISCELLANEOUS ☐

FOR SALE ☐

WANTED ☐

Name and Call Sign: .....

Address: .....

Phone Number (if applicable): .....

HEATHKIT HP-10 MOBILE POWER SUPPLY: 120 watt power (800V/300V/125V bias/12V heater from car battery, for HW12/HW32/FT-200 etc. $50 with manual. Konrad VK2DFM. Ph: (02) 452 4125 BH only.

ICOM 04A H/H: excellent cond. $390. Marconi FM/AM sig gen $200. Marconi FM dev meter $25. Hewlett Packard audio osc $80. Peter VK2CIM. Ph: (060) 25 1843.

KENWOOD TS-680S: HF + 6m multimode transceiver. As new $1500. Kenwood TR-9500 UHF multimode transceiver with BO-9 base. Mint condition $850. Kenwood R820 amateur band receiver. Excellent condition $450. (All Kenwood items complete with original packing, cables & manuals). 11 element 70 cm ATN Yagi complete with balun. New, unused $100. Mini-quad HQ-1 20, 15, 10 & 6 metre 2 element beam. Fair condition. $150. Paul VK2ATR QTHR. Ph: (049) 59 1788 BH (049) 59 3748 AH.

KENWOOD TS-820: tcvr with digital readout, matching Kenwood speaker, desk mic, manual. Absolute mint condition. $900 ONO. VK2BCA. Ph: (043) 90 8463 or (047) [redacted].

MICROLOG AIR-1: CW, RTTY & AMTOR interface for Commodore C-64 computer & any tcvr. $50. Les VK2PBY QTHR. Ph: (02) 624 4926.

POWER SUPPLY: Kenwood PS-430. Excellent condition. $350. VK2DYW QTHR. Ph: (02) 44 3279.

SENDATA: "Multi-Speed" modem with "Supercom III" software & cables for IBM PC, never connected. $215. RAM pack 32K for Toshiba T-100, in sealed package with instructions. $25. Unused boxed radio valves eg 807 $10, EF50 & 6SJ7 $5. Many other types. Send SAE for list. W Senior VK2WS, QTHR. Ph: (067) 75 2158.

YAESU FL-2100Z LINEAR AMP: WARC bands, unmarked condition, packing & manual. $1000. Also, Werner Wulf 6 element 10/15 metre duo-band antenna. $140. Pat VK2RZ. Ph: (043) 62 1235 (Gosford) until 9.00 pm.

YAESU EQUIPMENT: FT-107M HF 9 band all mode tcvr, scan & memory. $700. FP-107E power supply, 20 amp. $225. FC-902 ant tuner. Range 25-250-500 watts. $350. FT-225RD 2m all mode tcvr. 10W FM 25W SSB. $480. Accu keyer CMOS complete with power supply. $80. Toyo thruline SWR-PWR meter 144-435 MHz to 120 watts. $150. 8 el J-beam 2m. $75. Ben VK2DZD. Ph: (047) 54 2299 after 7 [redacted].

FOR SALE — VIC

IC-2A: 2m hand-held. Brand new cond. $300. FM-321 Philips 70 cm Mobile. Excel cond. $250. Oaker SWR 200 SWR & power meters 20/200W HF to VHF. Brand new. $75. Denkon jnr Monitor antenna tuner. $50. K V Scott VK3SS, 34 Henry Street, Malfra, Vic. 3860.

ICOM 505 6M TRANSCEIVER: inc FM option. Mint condition, mic — accessories & original packing. $675. Roger VK3XRS, QTHR. Ph: (051) 56 8291.

ICOM-02A VHF FM H/HELD TRANSCEIVER: in perfect condition. Includes protective case & extra BP-3 batt pack, & external speaker/microphone. Also includes Icom Nicad batt charger for BP-3 pack. $490. Evan VK3EJV. Ph: (03) 438 2878 AH.

MODEL 100 TELEPRINTER: C/w 240V power supply. Very good working condition. $150 ONO. Model 100 teleprinter as above but no keyboard, offers? STS model 191 UHF mobile inc crystals & 16 el Yagi. Good condition $110. 2metre 16 element Yagi 16 dBi gain 4m boom with Icom low noise preamp. As new. $250. Sagem dot matrix teleprinter. C/w punch & reader. New ribbon excellent condition. $400 ONO. Contact Gil VK3CQ, QTHR. Ph: (057) 55 1158.

MORSE KEYS: Clipsal model 610A with double contacts. New and unused, still in carton. $55. Contact Maurie VK3CWB, QTHR. Ph: (050) 22 2120.

RF SPEECH PROCESSOR: NFJ-525, original condition. $50. David VK3BFB. Ph: (03) 587 1593.

FOR SALE — QLD

AR MAGAZINES: 1983 through 88. Mint condition. Reasonable offers. VK4WR. Ph: 41 1315.

FOR SALE OR SWAP: for HF transceiver-signal generators Marconi TF995B/5 220 kHz/220 MHz FM/AM/CW mint condition with handbook $650. Marconi TF144H/4 $100. Metrix 931H Standard $100. Ratcliffe 205, Gertech, Schomandl, Airmec CT221 $50 ea. Tx rx valves, transformers, meters, etc. Want to clear & get on the air again. Bob VK4OY QTHR. Ph: (07) 396 0886.

SWAN VHF 150: 2m all mode amplifier with 2 spare QQE 06/40 valves. $200. All offers to Fred VK4NMA, QTHR. Ph: (07) 396 3521.

Advertiser's Index

KENWOOD

TWO IN ONE

TM-721A DUAL BANDER

Standard microphone included.
DTMF microphone optional extra.

ANNOUNCING
the new TM-721A 144/440MHz FM dual band transceiver

We've redefined the term "dual bander" with our brilliant new TM-721A. Using Kenwood's new Hybrid IC, the TM-721A packs more performance into its compact 1.8kg package than ever before. And it's built to take rough treatment with a solid die-cast chassis.

Specs are state-of-the-art. The receiver uses the latest GaAs FETs which together with an improved antenna switching circuit provide superb sensitivity and wide dynamic range. Power output is a punchy 45W (2m).

Other innovative features include:

- Dual watch function. The TM-721A may receive both VHF and UHF bands at the same time.
- Selectable full duplex operation across bands.
- Automatic band change. Change between main-band and sub-band when a signal is present.
- Call channel function. A front panel "Call Channel" key allows instant recall of frequency, repeater offset and sub-tone on each band (UHF and VHF).
- 30 memory channels. Functions include alert frequency storage, repeater offset, sub-tone, limits of band scan, transmit and receive frequency, allowing for standard and odd offsets.
- Dual LCD displays.
- Programmable scanning.
- Optional multi function remote handset (model RC-10).

KENWOOD ELECTRONICS AUSTRALIA PTY. LTD.

4E WOODCOCK PLACE, LANE COVE, SYDNEY, N.S.W., 2066. Ph. (02) 428 1455.

YOUR AUTHORISED KENWOOD DEALER, BELOW, WILL GUARANTEE SATISFACTION:
Further, beware of dealers not listed in this advertisement who are selling Kenwood communications equipment. All Kenwood products offered by them are not supplied by Kenwood Australia Pty. Ltd. and have no guarantees applicable.

NSW: Sydney, Emtronics (02) 211 0988. **Parramatta,** Capital Communications (02) 633 4333. **Inverell,** Reg Stockman Communications (067) 22 1303. **Cessnock,** Robertson Electronics (049) 90 7908. **Wollongong,** Marelec Pty. Ltd. (042) 29 1455. **Port Macquarie,** DX Engineering (065) 84 9921. **Lismore,** Frank Boundy (066) 86 2214. **ACT:** O'Connor, Alex Johnson (062) 47 9121. **VIC: Mornabbin:** Measure Tech Supplies Pty. Ltd. (03) 553 4566. **Melbourne,** Emtronics (03) 670 0330. **Ballarat,** Brian Stares (053) 39 2808. **Bendigo,** Simpro Electronics (054) 43 1977. **TAS. Hobart,** Watsons Wireless (002) 44 4303. **Launceston,** Marine & Communication (003) 31 2711. **Burnie,** W.A. Electronics (004) 31 7733. **QLD: Albion,** Mitchell Radio Co. (07) 357 6830. **Brisbane,** Emtronics (07) 394 2555. **SA & NT: Port Adelaide,** Amateur Telecommunications Systems Pty. Ltd. (08) 47 3688. **WA. Victoria Park,** Wills Electronics (09) 470 1118. **Ferndale,** Bay Radio (09) 451 3561. **Osborne Park,** Ford Electronics (09) 242 1766.

THE NEW ICOM IC32AT, OVER. WITH ITS DUPLEX FACILITY, OVER. MEANS YOU WON'T HAVE TO TALK LIKE THIS, OVER AND OUT.

The IC32AT is the newest dual band handheld transceiver by Icom.

It has been designed with the most advanced VHF technology the electronics industry can offer.

And this little 2 metres and 70cm compact handheld offers full duplex facility.

Which means instead of a broken conversation, you can now simultaneously transmit on one band and receive on the other. Just like a telephone conversation.

No longer do you have to wait for a long "Over". It's full "Break in".

And with its high output power, you can be sure your words are heard. The IC32AT uses a custom designed power module as the final amplifier. Which means this transceiver puts out 5.5W on 2 metres and 5W on 70cm.

So you will never be at a loss to make that repeater.

What's even more incredible, each of the twenty memory channels can store two frequencies: operating frequency and offset frequency are just a couple of examples.

The Programmed Scan function scans all the frequencies between two programmable scan edge frequencies, while the Memory Scan function scans all memory channels in succession, except, of course, those you lock out. In short, you can scan 2 metres, 70cm or all channels.

Thanks to the handy little pocket beep, you'll never miss a call. By installing the UT-40 Tone Squelch Unit (sold separately) the transceiver functions as a pager

You can use the built-in DTMF keyboard to access a repeater and to make a phone patch. The key numbers and letters are printed large for quick and easy reading.

As for monitoring the input frequency when you work a repeater, that's as simple as pushing the Monitor switch on the side panel to open the squelch and check the frequency

Every five seconds, Priority Watch monitors the Call Channel, or one or all the memory channels in succession.

And that's while you operate!

When you want to change the frequency or the memory channel fast, the Dial Select changes the 1MHz, 100kHz digit or the memory channel directly. One push of the button does it.

All these functions not only make the Icom IC32AT the most advanced dual band handheld transceiver available, but also very easy to use.

Call (008) 338 915 for your nearest Icom stockist today.

The telephone conversation in itself will be a very good demonstration of the IC32AT's duplex facility.

Over and out.

ICOM

The Ba... Partnership ICO 0024

Iron-Powder And Ferrite Cores

POWER CAPABILITIES

The power handl ng capability of a core is affected by numerous factors. Ultimately, however, these factors w l reduce to one of two basic imitations: saturation of the core material or temperature r se of the wound unit.

Strictly from the saturation consideration, a core's power handling capability is proportional to:

$$\text{Power} \sim \frac{V_e \, f \, B_{max}^2}{u_{eff}}$$

V_e = Core volume; F = Frequency; Bmax = Maximum flux density; u_{eff} = Permeability at Bmax

With Bmax in gauss given by Faraday's Law

$$B_{max} = \frac{E \times 10^8}{4.44 A_e N f}$$

E = RMS Voltage drop (volts); A_e = Cross-sectional area (cm^2); N = Number of turns; f = Frequency (Hertz)

For the Ferrite mater a s below u 1000, Bmax ~ 1500 gauss: while those above u 1000 have Bmax ≅ 3000 gauss. The Bmax for the iron powder materials is generally in excess of 10,000 gauss.

From the above Formulas it can be seen that for a given frequency and operating flux density, lower permeab l ty materials can handle more power. In the manufacturing process of iron powder, minute air gaps are distributed throughout the mater al accounting for the ower permeabilities and greater power capabi lities pr or to saturat on.

As earl er stated, the other m ting factor n power handl ng capability is the temperature rise of the wound unit. Th s temperature rise is a direct result of both copper and core loss. Temperature rise can be approximated using the fo lowing formula:

$$\text{Temperature Rise } (^\circ C) = \left[\frac{\text{Total Power Dissipation (Milliwatts)}}{\text{Available Surface Area } (cm^2)}\right]^{.833}$$

Wh le for saturation mi ted cases power handling varies with core volume, it can be seen that when temperature rise is the limit ng factor, surface area becomes the primary concern.

In DC and ow frequency app cat ons, determination of copper loss is quite straightforward. The power loss = I^2R where I is current in amps and R is the DC resistivity of the winding in ohms. In h gh frequency app cat ons, skin effect must also be taken into account when determining the effective resistivity of the w nding. For example, at 20 KHz #18 wire will begin to have skin effect, wh le at 2 MHz #38 wire will begin to exhibit increased resistivity.

Core oss nformation is typically presented in terms of loss per unit volume as a function of AC f ux density. (DC flux does not generate not ceable core loss.) For both ferrites and iron powder, at a given AC f ux density, losses increase with frequency quite linearly. While for a given frequency, osses increase squared with AC flux density. This information is available upto 100 KHz for #77, F, and J ferrite materials and upto 300 KHz for #26 iron powder material.

At the present time core loss nformation is not available for the RF frequencies or the other materials. However, t can genera ly be considered that n RF applications, ferrites will be saturation limited, while iron powder will be temperature rise limited. Based on rough estimates, the RF iron powders w l generally be limited to operation below 1000 gauss.

For years the iron powder T-200-2 has been used to handle 1000 watts when used as an antenna balun or 100 watts when used in a properly tuned LC tank circuit.

AMIDON CATALOGUE and DATA BOOK

For more data and applications of ferrite materials oredr your copy of the AMIDON Catalogue from Stewart E ectronics. Catalogue contains 74 pages of data graphs on the ful range of AMIDON listed in this catalogue. Order Stock No BX44

For an in-depth discussion of all kinds of noise problems we highly recommend the following book by W am Nelson

INTERFERENCE HANDBOOK
by W Nelson Edited by William Orr

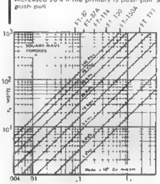
We also recommend the following valuable book for the Electronic Technician and Engineer

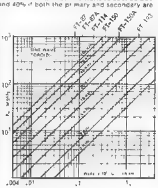
Ferromagnetic-Core Design and Application Handbook
by M F (Doug) DeMaw

Ferrite Toroidal Cores for Power App.

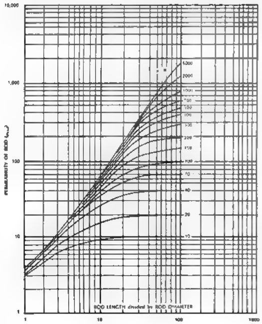
GUIDE TO SELECT PROPER SIZE CORE for a G VEN POWER

For a given power choose a core size which has a WaAc equal to or greater than the value obtaind from the graph. If the frequency is variable use the owest operat ng frequency. The power hand ing capacity of a given core is direct y proportional to the f ux leve . B the frequency f and the den ty (C). Thus the WaA needed for y ur perating cond ions may be read ly obtained from the graphs below. Fo sa urat ng sq are wave nverters d vide the WaAc by 1 8 for the F material. the J material is not recommended for this type of application. Saturating inverters with power levels of more than 50 wa ts or frequencies of more than 10KHz are not recommended due o excess ve y h gh T va es. For push pu transformers, the wire size may be reduced 30% one wire size) but the WaAc va ue shou d be increased 20% if the primary is push pull and 40% if both the pr mary and secondary are push pull.



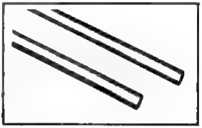


AMIDON Ferrite Rods



Permeability of Rod vs. Rod Length Divided by Rod Dia. for Various Materials—;
This family of curves shows the value of the effective permeability of a ferrite rod as a function of its length to diameter ratio, as well as a function of the material permeability of the rod. It illustrates that generally a great difference exists between the material permeability and the effective permeability of a rod. It also illustrates how, in some instances, the effective permeability of a rod can be influenced by changing its mechanica dimensions, more than by changing its material permeability, while in some other cases, the reverse is true.

AMIDON Associates Inc.



Ferrite rods are available in two standard stock mater als (Mix 33 & Mix 61) in a variety of sizes. Both materials may be used for antenna and choke applicat ons.

ANTENNAS **Mix 61** Material would normally be used for applicat ons in the range 600KHz to 10MHz. For lower frequencies and the VLF range the **Mix 33** mate als are more suitable.

CHOKES. For applications in the range up to 7MHz the **Mix 33** material wou d no ma y be the most appropriate. for applications in the range 5 to 30MHz the **Mix 61** material would be more suitable. The **Mix 33** materials are also suitable for audio use such as speaker cross-over nductors. Due to the open magnetic circuit of the rod configuration considerable current can be tolerated before saturation.

Further information on designing with ferr te rods is available n the AMIDON Iron Power and Ferrite Coil Forms handbook (order from Stewart Electronics) and in the book Ferro-Magnetic Core Design and Application Handbook by M F DeMaw.

Amidon No.	Stock No. A_l Value	Ampere Turns	Dimensions OD(mm)	Dimensions L(mm)
Mix 61 — 0.5MHz to 30MHz — Permeability 125 —				
R-61-050-400	FC570 Al 43	280	12.7	100
R-61-050-750	FC571 Al 49	575	12.7	190
Mix 33 — 0.1MHz to 1MHz — Permeability 800 —				
R-33-050-200	FC572 Al 465	465	12.7	50
R-33-050-400	FC573 Al 58	300	12.7	100
R-33-050-750	FC574 Al 64	200	12.7	190
R-33-075-1200	FC575 Al 115	330	19.0	305
A_l values are in mH/1000 turns				

AMIDON Iron-Powder Toroidal Cores

Physical Dimensions — Iron-Power Toroidal Cores

CORE SIZE	Outer Diam. (mm)	Inner Diam. (mm)	Height (mm)	Mean Path L (cm)	Cross Sect. A (cm²)	Volume V (cm³)
T12	3.18	1.57	1.27	0.75	0.01	0.007S
T16	4.06	1.98	1.52	0.95	0.015	0.015
T20	5.08	2.24	1.78	1.15	0.025	0.029
T25	6.48	3.05	2.44	1.50	0.042	0.063
T30	7.80	3.84	3.26	1.89	0.065	0.115
T37	9.53	5.21	3.25	2.32	0.07	0.153
T44	11.20	6.82	4.04	2.67	0.107	0.284
T50	12.7	7.70	4.83	3.28	0.121	0.374
T68	17.50	9.40	4.83	4.24	0.193	0.803
T80	20.20	12.60	6.35	5.15	0.242	1.25
T94	23.90	14.20	7.92	6.00	0.385	2.27
T106	26.90	14.50	11.10	6.50	0.69	4.56
T130	33.00	19.80	11.10	8.29	0.733	6.08
T157	34.90	24.10	14.50	10.05	1.14	11.30
T184	46.70	26.10	18.00	11.12	2.04	21.90
T200	50.80	31.80	14.00	12.97	1.33	17.30
T200A	50.80	31.80	25.40	12.97	2.42	31.40
T225	57.20	35.60	14.00	14.59	1.50	21.80
T225A	57.20	35.60	25.40	14.59	2.73	39.80
T300	77.20	48.00	12.70	19.62	1.79	35.00
T300A	77.20	48.00	25.40	19.62	3.56	71.00
T400	102.00	57.20	16.50	24.94	3.66	91.30
T400A	102.00	57.20	33.00	24.94	7.32	183.00

AMIDON Associates, INC.

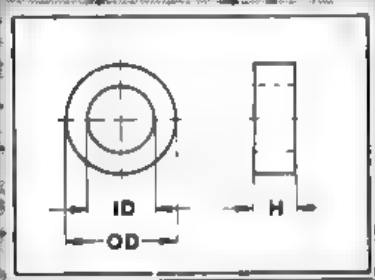
Number of Turns vs. Wire Size and Core Size

Approximate maximum number of turns-single layer wound-enameled wire

Wire AWG	Core Size T200	T130	T106	T94	T80	T68	T50	T37	T25	T12
10	33	20	12	12	10	6	4	1	—	—
12	43	25	16	16	14	9	6	3	—	—
14	54	32	21	21	18	13	8	5	1	—
16	69	41	28	28	24	17	13	7	2	—
18	86	53	37	37	32	23	18	10	4	1
20	111	67	47	47	41	29	23	14	6	1
22	140	86	60	60	53	38	30	19	9	2
24	177	109	77	77	67	49	39	25	13	4
26	223	137	97	97	85	63	50	33	17	7
28	281	173	123	123	108	80	6	42	23	9
30	357	217	154	154	136	101	81	54	29	13
32	439	272	194	194	171	127	103	68	38	17
34	557	346	247	247	218	162	132	86	49	23
36	683	424	304	304	268	199	162	108	62	30
38	875	544	389	389	344	256	209	140	80	39
40	1103	687	492	492	434	324	264	178	102	51

HOW TO ORDER —:

Core Size	26-mix yl/wh μ = 75 0 - 1.0 MHz	3-mix grey μ 35 .05 - 0.5 MHz	15-mix rd/wh μ 25 0.1 - 2 MHz	1-mix blue μ 20 0.5 - 5 MHz	2-mix red μ 10 1 - 30 MHz	6-mix yellow μ 8 2 - 50 MHz	10-mix black μ 6 10 - 100 MHz	12-mix gr/wh μ 3 20 - 200 MHz	0-mix tan μ 1 50 - 300 MHz
T400A—	FC300 A_L 2600				FC301 A_L 360				
T400—	FC302 A_L 1320				FC303 A_L 185				
T300A—	FC304 A_L 1800				FC305 A_L 228				
T300—	FC306 A_L 825				FC307 A_L 115				
T225A—	FC308 A_L 1600				FC309 A_L 215				
T225—	FC310 A_L 850	FC311 A_L 425			FC312 A_L 120	FC313 A_L 100			
T200A—	FC314 A_L 1550	FC442 A_L 460		FC443 A_L 455	FC315 A_L 218	FC316 A_L 180			
T200—	FC317 A_L 895	FC318 A_L 425		FC319 A_L 250	FC320 A_L 120	FC321 A_L 100			
T184—	FC322 A_L 1640	FC323 A_L 770		FC324 A_L 500	FC325 A_L 240	FC326 A_L 195			
T157—	FC327 A_L 970	FC328 A_L 420	FC329 A_L 360	FC330 A_L 320	FC331 A_L 140	FC332 A_L 115			
T130—	FC333 A_L 785	FC334 A_L 350	FC335 A_L 250	FC336 A_L 200	FC337 A_L 110	FC38 A_L 96			FC339 A_L 15
T106—	FC340 A_L 900	FC341 A_L 450	FC342 A_L 345	FC343 A_L 325	FC344 A_L 135	FC345 A_L 116			FC 346 A_L 19
T94—	FC347 A_L 590	FC348 A_L 248	FC349 A_L 200	FC350 A_L 160	FC351 A_L 84	FC352 A_L 70	FC353 A_L 58	FC354 A_L 32	FC355 A_L 10.6
T80—	FC356 A_L 450	FC357 A_L 180	FC358 A_L 170	FC359 A_L 115	FC360 A_L 55	FC361 A_L 45	FC362 A_L 32	FC363 A_L 22	FC364 A_L 8.5
T68—	FC365 A_L 420	FC366 A_L 195	FC367 A_L 180	FC368 A_L 115	FC369 A_L 57	FC370 A_L 47	FC371 A_L 32	FC372 A_L 21	FC373 A_L 7.5
T50—	FC374 A_L 320	FC375 A_L 175	FC376 A_L 135	FC377 A_L 100	FC378 A_L 49	FC379 A_L 40	FC380 A_L 31	FC381 A_L 18	FC382 A_L 6.4
T44—	FC383 A_L 360	FC384 A_L 180	FC385 A_L 160	FC386 A_L 105	FC387 A_L 52	FC388 A_L 42	FC389 A_L 33	FC390 A_L 19	FC391 A_L 6.5
T37—	FC392 A_L 275	FC393 A_L 120	FC394 A_L 90	FC395 A_L 80	FC396 A_L 40	FC397 A_L 30	FC398 A_L 25	FC399 A_L 15	FC400 A_L 4.9
T30—	FC401 A_L 225	FC402 A_L 140	FC403 A_L 93	FC404 A_L 85	FC405 A_L 43	FC406 A_L 36	FC407 A_L 25	FC408 A_L 16	FC409 A_L 6.0
T25—		FC410 A_L 100	FC411 A_L 100	FC412 A_L 70	FC413 A_L 34	FC414 A_L 27	FC415 A_L 19	FC416 A_L 12	FC417 A_L 4.5
T20—		FC418 A_L 90	FC419 A_L 65	FC420 A_L 52	FC421 A_L 27	FC422 A_L 22	FC423 A_L 16	FC424 A_L 10	FC425 A_L 3.5
T16—		FC426 A_L 61	FC427 A_L 55	FC428 A_L 44	FC429 A_L 22	FC430 A_L 19	FC431 A_L 13	FC432 A_L 8	FC433 A_L 3.0
T12—		FC434 A_L 60	FC435 A_L 50	FC436 A_L 48	FC437 A_L 20	FC438 A_L 17	FC439 A_L 12	FC440 A_L 7	FC441 A_L 3.0



Number shown in reverse STEWART stock number. —always order by this number only—

To obtain **AMIDON** part number add mix number to core size i.e. T400A-26

A_L value shown under stock number (μH / 100 turns)

$$Turns = 100\sqrt{\frac{\text{desired L (uh)}}{A_L\ (\text{uh}/100\text{t})}}$$

AMIDON Iron-Powder Toroidal Cores Con't

MATERIALS

Mix 3 (35 permeability) A carbonyl 'HP' iron-powder material having excellent stability and good 'Q' for the lower frequencies from 50 KHz

Mix 15 (25 permeability) A carbonyl 'GS6' iron-powder material offering good stability for commercial broadcast frequencies where good 'Q' and high order of permeability must be maintained

Mix 1 (20 permeability) A carbonyl 'C' iron-powder material very similar to the **mix 3** material, but has a higher volume resistivity and offers better stability than the **mix 3** material

Mix 2 (10 permeability) A carbonyl 'E' iron-powder material having high volume resistivity and offers high 'Q' for the 1 MHz to 30 MHz frequency band. Most widely used of all iron-powder materials

Mix 6 (8 permeability) A carbonyl 'SF' iron-powder material very similar to the **mix 2** material, but has an improved 'Q' for the higher frequencies to 50 MHz. Higher cost than **mix 2** material

Mix 10 (6 permeability) A carbonyl material offering high 'Q' for frequencies to 100 MHZ

Mix 12 (3 permeability) A synthetic oxide material (Irn 8) haveing moderate 'Q' above 100 MHz

Mix 0 (1 permeability) This material has a permeability of 1. Most commonly used for frequencies above 200 MHz

Mix 26 (75 permeability) A hydrogen reduced material very similar to **mix 41** material, but offers extended frequency range

Iron-Powder toroidal cores are available in numerous sizes ranging from 0.05" to more than 5" in outer diameter. There are two basic material groups.

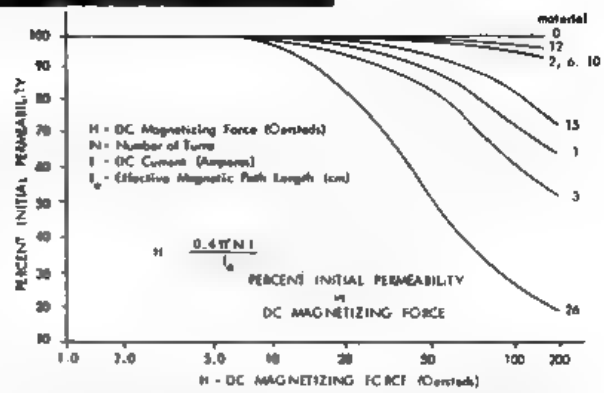
The Carbonyl Irons and the Hydrogen Reduced Irons. The Carbonyl types are especially noted for there excellent stability over a wide range of temperatures and flux levels. Their permeability range is from less than 3mu to 35 mu and can offer excellent 'Q' factors for the 50 KHz to 200 MHz frequency range. They are ideally suited for a variety of RF applications.

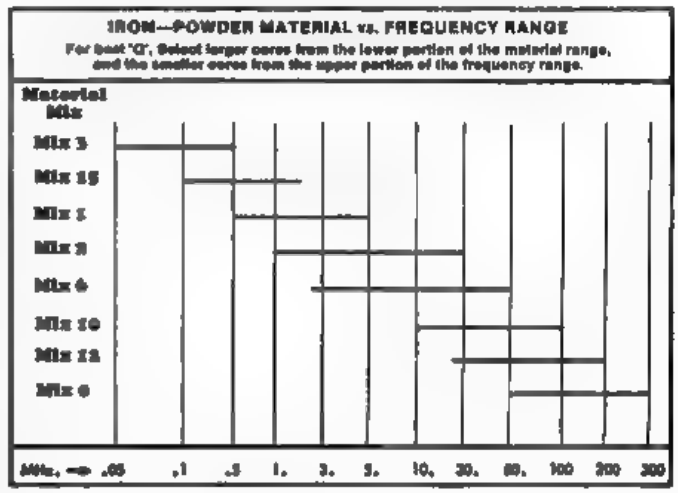
The frequency range specified for each material mix is especially important for tuned circuits where high 'Q' is essential. These same materials can also be used in broad-band applications where 'Q' is no longer a primary concern, therefore, be useful to considerably higher frequencies.

The Hydrogen Reduced Irons have permeabilities ranging from 35 mu to 90 mu. Some-what lower 'Q' values should be expected from this group of cores. They are mainly used for **EMI** filters and low frequency chokes. In recent years they have been very much in demand for use in both input and output filters for **switch-mode** power supplies.

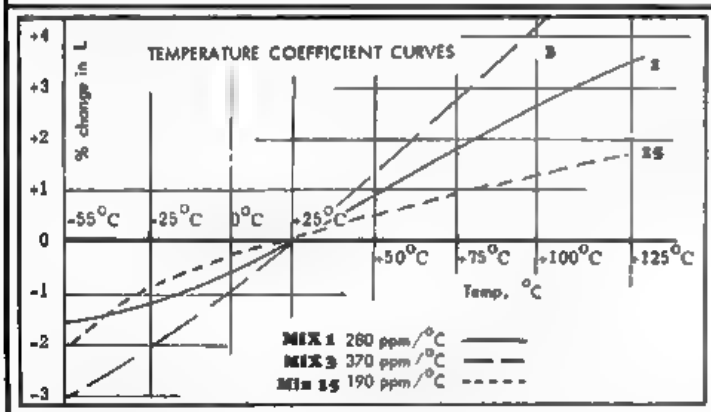
Toroidal cores in general are the most efficient of any core configuration. They are highly self-shielding since most of the flux lines are contained within the toroidal form. The flux lines are essentially uniform over the entire magnetic path length and consequently stay magnetic fields will have very little effect on a toroidal inductor. It is seldom necessary to shield or isolate a toroidal inductor to prevent feedback or cross-talk. Toroidal inductors simply do not like to talk to each other.

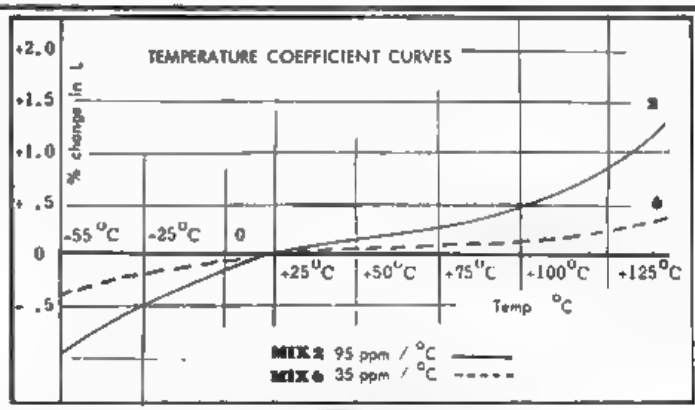
The number of turns required for a specific inductance may be calculated by using the 'Al' value for the selected core and the formula at the bottom of the 'HOW TO ORDER' chart.

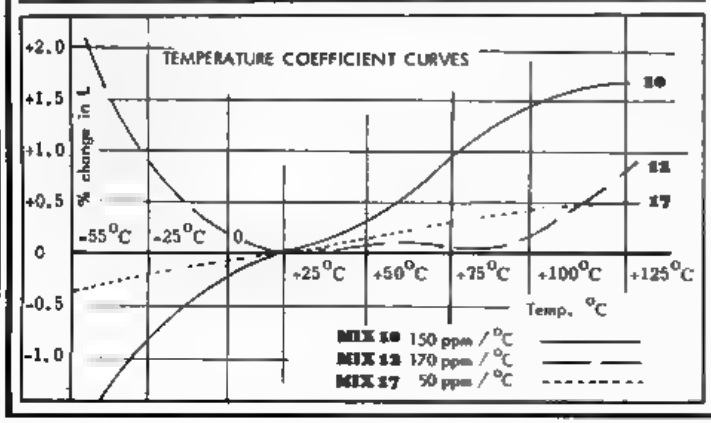


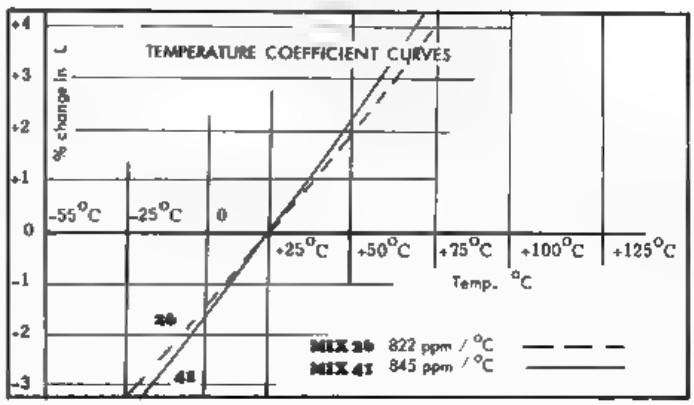


Temperature Coefficient Charts for Iron-Power Toroidal Cores









AMIDON Ferrite Toroidal Cores for Resonant Circuits and Power Applications

MATERIALS

Mix 68 (20 permeability) A Nickel-Zinc material having high resistivity and excellent temperature stability. High 'Q' for the frequency range 80 MHz to 180 MHz. Used for high frequency inductors, antennas and wide-band amplifiers as well as linear power amplifiers.

Mix 63 (40 permeability) A nickel-Zinc ferrite material having low permeability and high volume resistivity. A high 'Q' material for the frequency range 15 MHz to 25 MHz. Used extensively in toroidal form for high 'Q' inductors.

Mix 67 (40 permeability) A nickel-Zinc material very similar to the **mix 63** material. It has good temperature stability, a higher saturation flux density than **mix 63** material, and a somewhat lower volume resistivity. Very useful for high 'Q' applications from 10 to 80 MHz. Very much in demand for wide-band linear power amplifiers from 50 to 500 MHz.

Mix 61 (125 permeability) A nickel-Zinc material which offers moderate temperature stability and high 'Q' for the 0.2 to 15 MHz frequency range. Also commonly used for wide-band transformers up to 299 MHz.

Mix 43 (850 permeability) A Nickel-Zinc ferrite material having high volume resistivity. Widely used for medium frequency toroidal inductors and wide band transformers up to 50 MHz.

Mix 77 (2000 permeability) A Manganese-Zinc material. High saturation flux density at high temperatures. Low core losses in the 1 KHz to 1 MHz frequency range. Ideally suited for power conversion transformers, wide-band transformers up to 30 MHz, and high flux density noise suppression applications in the 2 to 40 MHz region.

Mix 78 (2000 permeability) A Manganese material. Has low volume resistivity. A high 'Q' product for low frequencies. Has good saturation properties. Widely used in toroidal form for high 'Q' inductors from 1 KHz to 500 KHz.

Mix F (3000 permeability) A Manganese Zinc ferrite material similar to the **mix 77** material yet having a somewhat higher initial permeability. High saturation flux density at high temperatures. Usefull for power conversion transformers. Available in the larger toroidal configurations.

Mix 75 (5000 permeability) A Manganese-Zinc ferrite material having low volume resistivity and low core losses from 1 KHz to 1 MHz. Used for low level power conversion transformers, wide-band transformers and pulse transformers.

Mix J (5000 permeability) A Manganese-Zinc ferrite material similar to the **mix 75** material. Commonly used for both power conversion transformers and common-mode line filter baluns. Available in the larger toroidal configurations.

AMIDON Associates, INC.

Physical Dimensions — Ferrite Toroidal Cores

CORE SIZE	Outer Diam. (mm)	Inner Diam. (mm)	Height (H) (mm)	Mean Path L (cm)	Cross Sect. A (cm²)	Volume V (cm³)
FT23	5.85	3.05	1.53	1.34	0.021	0.029
FT37	9.53	4.75	3.18	2.15	0.078	0.163
FT50	12.70	7.14	4.75	3.02	0.133	0.401
FT50A	12.70	7.93	6.35	3.68	0.152	0.559
FT50B	12.70	7.93	12.70	3.18	0.303	0.964
FT82	20.96	13.11	6.35	5.26	0.248	1.29
FT87A	22.10	13.72	12.70	5.42	0.522	NA
FT114	29.01	19.05	7.50	7.42	0.375	2.79
FT114F J	29.01	19.05	7.50	7.32	0.349	NA
FT114A	29.01	19.01	13.85	7.42	0.69	5.13
FT140	35.56	22.86	12.70	9.02	0.808	7.28
FT150	38.10	19.05	6.35	8.88	0.581	NA
FT150A	38.10	19.05	12.70	8.30	1.11	NA
FT193	49.03	31.75	15.88	12.31	1.18	NA
FT193A	49.03	31.75	18.05	12.31	1.18	NA
FT240	60.96	35.56	12.70	14.80	1.81	23.90

FERRITE MAGNETIC PROPERTIES

PROPERTY	Mix 68	Mix 63	Mix 67	Mix 61	Mix 43	Mix 77	Mix 78	Mix F	Mix 75	Mix J
Permeability (μ)	20	40	40	125	850	1800	2000	3000	5000	5000
Saturation Flux (Gauss)	2000	1850	3000	2350	2750	4600	3500	4700	3900	4300
Curie Temp. °C	500	450	500	350	130	200	150	250	160	140
Temp Coef % / °C	0.06	0.10	0.13	0.15	1.0	0.60	0.60	0.60	0.90	0.90
Tuned Circuit Frequency (MHZ)	80-180	15-25	10-80	0.2-10	0.01-1	0.001-1	0.001-1	0.001-1	0.001-1	0.001-1
Wide-Band Frequency (MHz)	200-1000	25-200	50-500	10-200	1-50	0.5-30	0.5-30	0.5-30	0.2-15	0.2-15

HOW TO ORDER —

CORE SIZE	MIX 68 μ = 20	MIX 63 μ = 40	MIX 67 μ = 40	MIX 61 μ = 125	MIX 43 μ = 850	MIX 77 μ = 1800	MIX 78 μ = 2000	MIX F μ = 3000	MIX 75 μ = 5000	MIX J μ = 5000
FT-23	FC450 A_L 4.0	FC451 A_L 7.9	FC452 A_L 7.9	FC453 A_L 24.8	FC454 A_L 188	FC455 A_L 196	FC456 A_L 396		FC457 A_L 990	
FT-37	FC458 A_L 8.8	FC459 A_L 17.7	FC460 A_L 17.7	FC461 A_L 55.3	FC462 A_L 420	FC463 A_L 884	FC464 A_L 884		FC558 A_L 2210	
FT-50	FC465 A_L 11.00	FC466 A_L 22.00	FC467 A_L 22.00	FC468 A_L 68.00	FC469 A_L 523	FC470 A_L 1100	FC471 A_L 1100		FC472 A_L 2750	
FT-50A	FC473 A_L 2.00	FC474 A_L 24.00	FC475 A_L 24.00	FC476 A_L 75.00	FC477 A_L 570	FC478 A_L 1200	FC479 A_L 1200		FC480 A_L 2990	
FT-50B		FC481 A_L 48.00	FC482 A_L 48.00	FC483 A_L 150.00	FC484 A_L 1140	FC485 A_L 2400	FC486 A_L 2400			
FT-82	FC487 A_L 20	FC488 A_L 22.40	FC489 A_L 22.40	FC490 A_L 70.00	FC491 A_L 557	FC492 A_L 1170	FC493 A_L 1170		FC494 A_L 2930	
FT-87A								FC495 A_L 3620		FC496 A_L 6040
FT-114	FC497 A_L 12.70	FC498 A_L 25.40	FC499 A_L 25.40	FC500 A_L 79.30	FC501 A_L 603	FC502 A_L 1270	FC503 A_L 1270	FC504 A_L 1900	FC505 A_L 3170	FC506 A_L 3170
FT-114A				FC507 A_L 146			FC508 A_L 2340			
FT-140			FC562 A_L 45.00	FC563 A_L 40	FC564 A_L 952	FC565 A_L 34	FC566 A_L 2340			
FT-150										10
FT-150A								FC511 A_L 5020		FC512 A_L 8370
FT-193										FC514 A_L 6065
FT-193A								FC513 A_L 4460		
FT-240		FC515		FC516	FC517 A_L 1240	FC518 A_L 2740	FC519 A_L 2740			

Number shown in reverse STEWART stock number. —always order by this number only—

To obtain AMIDON part number add mix number to core size i.e. FT23-72

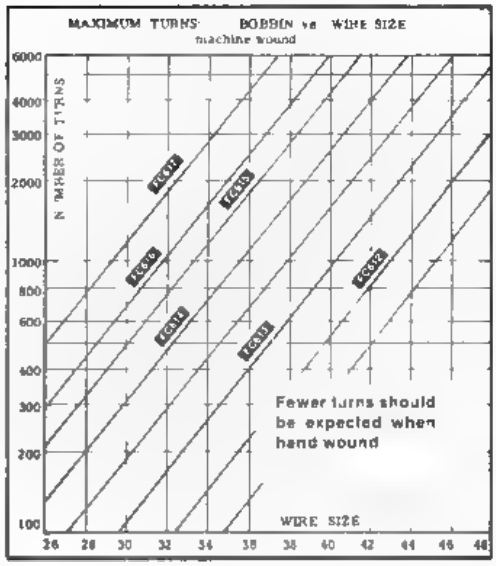
***A_L* value shown under stock number (mH / 1000 turns)**

AMIDON Ferrite Pot Cores

AMIDON Associates Inc.

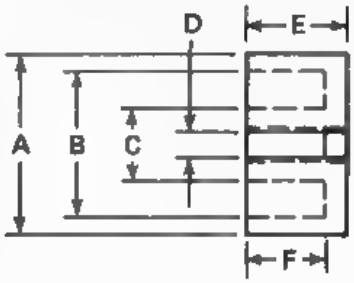
The Pot Cores listed here are of the #77 Manganese Zinc Ferrite material which has a permeability of 2000. This material has a high saturation flux density at high temperatures. Core losses are very low in the 1KHz to 1MHz frequency range. For further specifications of #77 material see the AMIDON "Iron Powder and Ferrite data book" which can be ordered form Stewart Electronics.
Here are some of the advantages Pot Cores can offer – (1) A large amount of inductance can be obtained with a relatively small core size. (2) They are completely self-shielding which will eliminate all interference from adjacent RF fields. (3) Pot cores are very easily and speedily wound thereby reducing assembly time to a minimum.
The pot core assembly is supplied complete with two Pot Core halves, a nylon mounting bolt, and a single section bobbin.

$$\text{Turns} = \sqrt{\frac{\text{desired L (mh)}}{A_L\ (\text{mh}/1000\,t)}} \times 1000$$

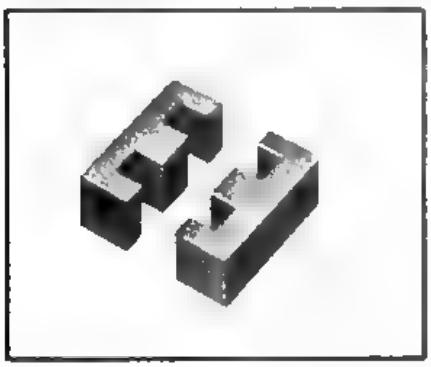


All "Pot Cores" are supplied as a kit of " Two Halves, one Coil Former and a Nylon nut and bolt for mounting"

STOCK No.	AMIDON No.	Physical Dimensions (mm)						Mag Properties		
		A	B	C	D	E	F	A_e(mm)	A_{cp}(mm)²	$A_L$mh/1000t
FC612	PC 1107-77	11.10	9.20	4.60	2.10	3.12	2.27	15.9	15.9	1420
FC613	PC 1408-77	14.05	11.80	5.90	3.10	4.18	2.90	20.00	25.00	1960
FC614	PC 2213-77	21.60	18.70	9.25	4.55	6.70	4.70	31.80	63.00	3060
FC615	PC 2616-77	25.50	21.60	11.30	5.55	8.05	5.60	37.20	93.00	4700
FC616	PC-3019-77	30.00	25.40	13.30	5.55	9.40	6.60	45.00	136.00	5900
FC617	PC 3622 77	35.60	30.40	15.90	5.55	10.85	7.40	52.00	202.00	7680



AMIDON Ferrite 'E' Cores

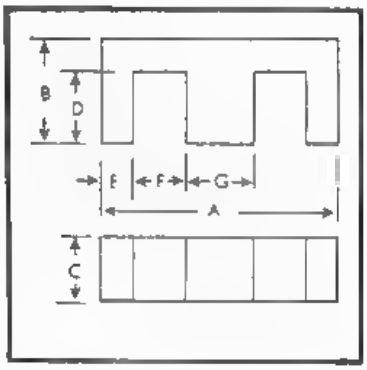


AMIDON Associates Inc.

Type 77 Ferrite Material
Permeability 2000

These cores are ideally suited for low power applications up to 200 watts.
Cores are supplied as a kit comprising —: two core halves and a nylon bobbin for easy winding.
For more complete data on type '77' ferrite material see AMIDON "Iron-Powder and Ferrite Coil Forms" data book which may be ordered from Stewart Electronics.

All "E" cores are supplied as a kit of "Two E cores and one Coil Former"



STOCK No.	AMIDON No.	E-Core Physical Dimensions (mm)							
		A	B	C	D	E	F	G	Power
FC618	EA-77-188	19.3	8.10	4.75	5.72	2.36	4.89	4.76	10 watts
FC619	EA-77 250	25.4	10.00	6.35	6.48	3.18	6.35	6.35	20 watts
FC620	EA-77-375	35.00	14.28	9.53	9.53	4.75	7.93	9.53	70 watts
FC621	EA-77-500	41.28	16.51	12.70	10.29	5.35	7.93	12.70	100 watts
FC622	EA-77-625	42.68	20.96	15.37	15.07	5.85	9.53	11.98	200 watts

$$\text{Turns} = \sqrt{\frac{\text{desired L (mh)}}{A_L\ (\text{mh}/1000\,t)}} \times 1000$$

E-Core Magnetic Properties							
STOCK No.	A_e (mm)²	l_e mm	V_e (mm)³	A_p (mm)²	A_w (mm)²	$A_e \times A_w$ (mm)⁴	A_L value mh/1000t
FC618	22.50	40.10	900	1650	55.70	1250	1280
FC619	40.40	48.00	1930	1700	80.60	325	1520
FC620	90.30	68.80	6240	3830	151.00	13,700	2540
FC621	160.00	76.70	12,300	5410	163.00	26,100	4090
FC622	184.00	98.00	18,000	7500	287.00	52,900	5210

MAGNETIC PROPERTIES of #77 MATERIAL

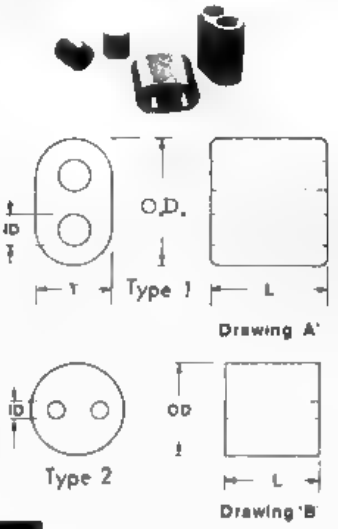
Initial permeability (U_o) = 2000 typical
Curie temperature (T_c) = 200° C
Saturation flux density (B_s) = 4800 gauss @ 10 oer
Amplitude permeability —
4500 @ 2000 gauss, room temperature
7000 @ 1000 gauss, 125°C
Core Losses: 12mW/cm³ @ 1000 gauss, 10KHz

AMIDON Ferrite Balun and Wide-Band Transformer Cores

This extended range of 2 hole balun and wide-band transformer cores are suitable for a range of applications in communications television data transmission instrumentation and similar areas
Whilst toroidal cores can be used for wide band applications these 2 hole cores will provide higher inductance-per-turn with lower leakage inductance and lower distributed capacitance thus over-coming two of the major causes of lack of bandwidth when using other core styles
These materials are offered to cover a large frequency range with a large range of sizes for applications from very low power up to cores suitable for 1 kW use at HF frequencies
These cores are also suitable for matching transformers in broad-band HF power amplifiers The primary concern when designing a wide-band transformer is to extend the band-width with minimum loss The factors which limit the band-width are inductive reactance and core loss which will limit operation at the lower frequencies also leakage inductance and distributed capacitance which will limit operation at the higher frequencies
The 2 hole balun may wound through both holes or through one hole and around the outside Winding through both holes will produce a higher inductance per turn Ferrite toroides and ferrite beads may also be used for winding wide-band transformers, however these configurations will produce a narrower band-width than the 2 hole balun core

F Range	MIX 43 20—80MHz	MIX 61 > 50MHz	MIX 75 < 30MHz	Dimensions (mm) OD	ID	L	T	Drawing
Core Size BN-*-202	FC580 Al 2890	FC581 Al 425	FC 582 Al 8500	13.34	3.81	13.97	7.5	A
BN-*-1702		FC584 Al 420		6.35	1.27	11.94	NA	B
BN-*-1802		FC583 Al 310		6.35	1.27	6.10	NA	B
BN-*-2302	FC585 Al 680	FC586 Al 100		3.48	0.89	6.10	2.04	A
BN-*-2402	FC587 Al 1275	FC588 Al 150	FC589 Al 3750	7.12	1.78	6.10	4.07	A
BN-*-3312	FC590 Al 5400			19.44	4.75	25.40	9.53	A
BN-*-7051	FC591 Al 6000			28.71	6.35	28.71	14.23	B

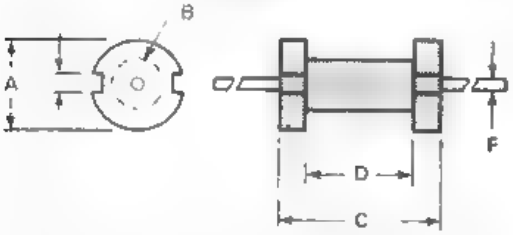
No. shown in Reverse is STEWART stock number — please order by this number only —
To obtain AMIDON part number, add mix number to core size number in place of * i.e. BN-43-202
Al values are (mH / per 1000turn)



AMIDON Ferrite Bobbin Cores

Ferrite bobbins provide a convenient means of winding RF chokes Because of there open magnetic path they can hand more current than toroids of a similar size To aid in the design of such chokes we have provided A_L values, a winding table and ampere-turn ratings for each bobbin

Size AMIDON Number	Mix # number	Stock No.	Al mH/1000 turns	NI Ampere/ turns	# number (AWG)	Dimensions (mm) A	B	C	D
B-72-1111	72	FC592	17	60	#22	4.98	2.72	12.70	10.16
B-72-1011	72	FC593	39	130	#22	9.45	4.75	19.05	12.70



Winding table: number of turns to completely fill bobbin.									
wire size	20	22	24	26	28	30	32	34	36
FC592	9	14	23	35	56	88	164	205	400
wire size	20	22	24	26	28	30	32	34	36
FC593	24	39	60	93	148	230	425	535	1050

FC592 # B-72-1111 A_L 17 NI 60

Inductance	wire turns	wire size	I (max)
10 uh	24	24	2.50
25 uh	38	26	1.60
50 uh	54	28	1.10
100 uh	77	30	.78
250 uh	121	31	.50
500 uh	171	32	.35
1.0 mh	243	34	.25
2.5 mh	383	36	.16
5.0 mh	542	37	.11
10.0 mh	762	38	.08

FC593 # B-72-1011 A_L = 39 NI = 130

Inductance	wire turns	wire size	I (max)
25 uh	25	20	5.20
50 uh	36	22	3.60
100 uh	50	24	2.60
250 uh	80	26	1.60
500 uh	113	27	1.10
1.0 mh	160	28	.80
2.5 mh	253	30	.50
5.0 mh	358	32	.36
10.0 mh	506	34	.25
25.0 mh	800	36	.16

Mix 43 material (850 permeability) is a NICKEL—ZINC ferrite material having high volume resistivity Widely used for medium frequency inductors and wide band transformers up to 50MHz Extensively used in the shielding bead form for the suppression of unwanted RF signals from 50MHz to 200MHz

Mix 61 a NICKEL—ZINC (125 permeability) which offers moderate temperature stability and high 'Q' for the 0.2MHZ to 15MHz frequency range. Primarily use in toroidal form for high 'Q' inductors. Also stocked in cores for wide-band balun use

Mix 72 (2000 permeability) a MANGANESE ZINC material having a low volume resistivity A high 'Q' product for low frequencies. Has good saturation properties. Widely used in the toroidal form for high 'Q' inductors from 1KHz to [redacted]

Mix 75 (2500 permeability) MANGANESE—ZINC ferrite material having low volume resistivity. Frequency range from 1KHz to 1MHz but for shielded bead applications offers high impedance to frequencies from 5MHZ to 50MHz Widely used for wide-band and shielded shielded bead applications. Also stocked in shielded-bead form and balun core configuration

AMIDON Multi-Hole Ferrite Beads

A Ferrite Bead is a small donut like device composed of ferromagnetic material. It has a center hole and is sold 2 & 6 hole and when slipped on to a current carrying conductor it will act as a tiny RF choke. Ferrite Beads are available in many sizes and also several different types of ferromagnetic materials. This device offers a simple convenient inexpensive and yet a very effective means of RF shielding, RF decoupling and parasitic suppression.

The most common noise generating suspects in high frequency circuits are power supply leads, ground leads connections and connections and interstage connections. Adjacent leads and unshielded conductors can also provide a convenient path for the transfer of energy from one circuit to another. A few Ferrite Beads of the appropriate material placed on these leads can greatly diminish or completely eliminate the unwanted noise frequencies. Best of all Ferrite Beads can be added to most any existing electronic circuit.

The Ferrite Bead offers very little or no impedance to the lower frequencies and to DC. At the higher frequencies the permeability and losses of the Ferrite material will vary with frequency. As the frequency increases the permeability will decline while the ideal resistance will rise to a peak. With a rise in frequency the bead will present a series resistance with very little reactance. Since the resistance is a function of the losses in the material it truly is a dissapative device. Futher more since the reactance is very low there is little chance of resonance which could destroy the suppression effect.

Depedance is directly proportional to the length of the bead therefore the impedance can be increased either by using a longer bead or by stringing several beads on the conductor. Since the magnetic field is totally contained within it does not matter whether the beads are touching or seperated.

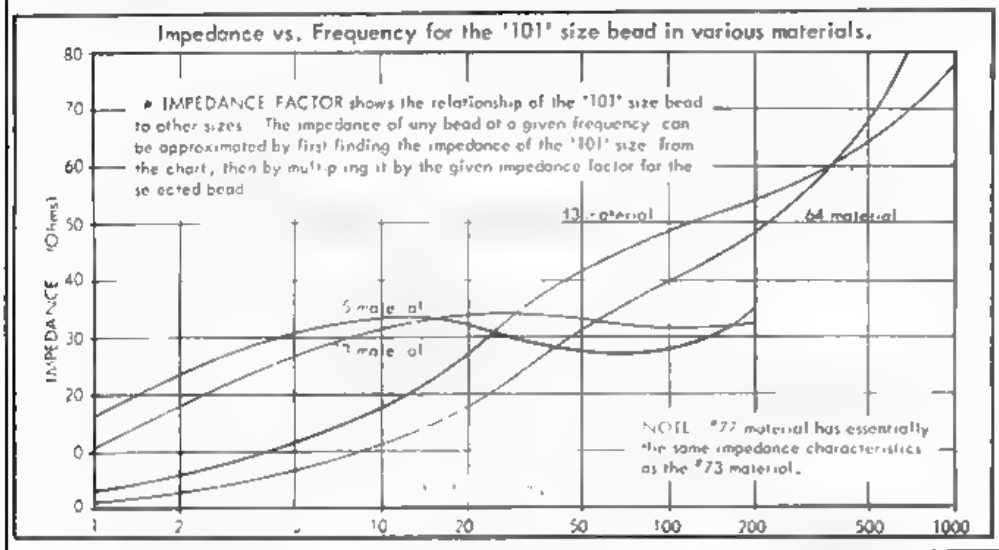
They do not have to be grounded and they cannot be detuned by external magnetic fields. Impedance can also be increased with multiple turns through a single bead.

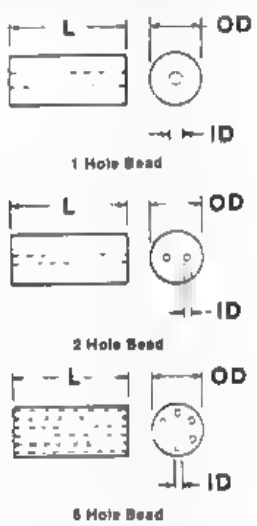
The impedance will be proportional to the number of turns squared. Since the attenuation is a function of both the bead impedance and the circuit impedance the bead will be most effective in low impedance circuits.

Fairly high current can be tolerated before saturation begins to occur. If saturation does occur the impedance will drop to a very low level and the bead will become ineffective as a noise suppression device. Once the cause of saturation has been removed the bead will return to normal operation with no ill effects.

Temperature rise above the the Curie point will cause the bead to become non-magnetic rendering it useless as a noise supressing device. As soon as the cause of the temperature rise has been corrected and the bead has been allowed to cool normal operation will be regained. A Ferrite Bead can tolerate several hundered degrees of temperature rise without permenant damage.

Ferrite Beads composed of the **mix 75** or **mix 75** material are semi-conductive and care should be taken not to position them in such a manner that they would be able to short uninsulated leads together or to ground. Most other materials with higher resistivity are non-conductive and this precaution is not necessary.

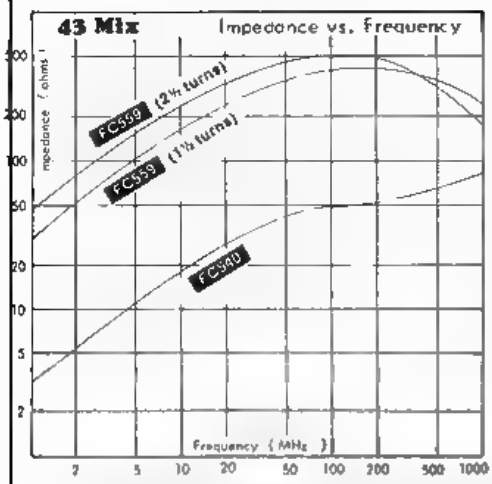


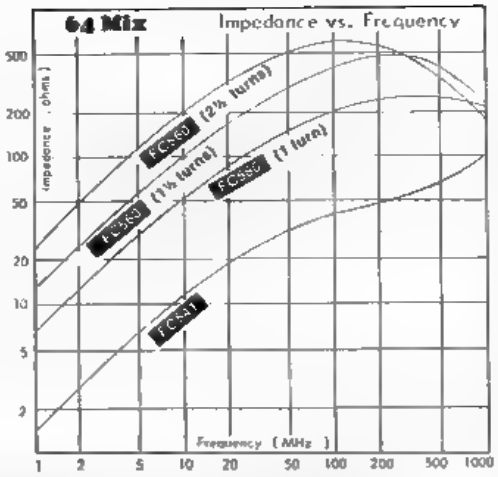


	MIX 43	MIX 64	MIX 73	MIX 75	MIX 77	Impedance	Dimensions (mm)		
UI	850	250	250	500					
Rv (ohms-cm)	10(5)	10(8)	10(2)	10(2)	10(3)				
F (MHz)	30—600MHz	0.2—2GHz	10—50MHz	5—15MHz	10—50MHz	Factor	OD	ID	L
Single Hole Beads —									
Core Size FB-101	FC540 *Al* 510	FC541 *Al* 150	FC542 *Al* 1500	FC543 *Al* 3000		1.00	3.15	1.3	3.00
FB-201	FC544 *Al* 360	FC545 *Al* 110	FC546 *Al* 1100			0.7	1.93	1.10	3.81
FB-601	FC547 *Al* 1300	FC548 *Al* 390	FC549 *Al* 3900			2.2	7.52	2.39	7.55
FB-1801	FC550 *Al* 2000		FC551 *Al* 5900			4.0	5.08	1.58	11.10
FB-2401	FC576 *Al* 520					1.1	9.66	5.01	4.83
FB-5621	FC552 *Al* 3800				FC553 *Al* 9600	7.0	14.28	6.35	28.58
FB-6301	FC554 *Al* 1100				FC555 *Al* 2600	2.2	9.53	4.93	10.42
FB-1020	FC556 *Al* 3210					6.3	25.4	12.70	28.45
FB-1024					FC557 *Al* 5590	4.6	25.4	12.70	20.96
Two Hole Choke Bead —									
FB-901		FC561				NA	6.35	2x1.27	10.50
Six Hole Choke Bead —									
FB-5111	FC559	FC560				NA	6.00	6x0.82	10.01

No. shown in Reverse is STEWART stock number — please order by this number only —
***UI* — Initial Permeability *Rv* — Volume Resistivity (ohms-cm) : *F* — Frequency Range (MHz)**
To obtain AMIDON part number ; add mix number to core size number i.e. FB-201 43
***Al* values are (nanohenerles / turn ^{2})**

AMIDON Multi-Hole Ferrite Beads con't





When wire is wound onto a toroidal core or a single-hole bead, the number of turns is identified by the number of times the conductor passes through the center hole. Because of its geometry a wire-turns must be completed around the outside of the core or the bead.

On the previous page we have given both the A_L and Z factors for single hole beads. The A_L value is proportional to the Z factor and the permeability of the bead. The Z factor is directly proportional to the ratio of the effective cross sectional area and the mean magnetic path length, (A_e / l_e).

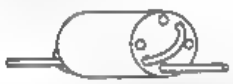
The above values are easily determined for toroidal cores and single-hole beads, but when a multi-hole bead is involved these values depend upon the exact winding pattern. Therefore it is impractical to provide this data without clearly identifying the type of winding.

For example a 6 hole bead is wound progressively from hole to hole, either a clockwise or a counter clockwise direction, the result will be considerably different than if it were wound in a criss-cross fashion as shown below. Again, the result will be significantly different if each wire turn should be completed around the outside of the bead, rather than through another hole.

The industry has standardized on the 1½ and 2½ turn criss-cross winding for the 6 hole bead as shown below. Curves for both these windings are shown at the left. Pre-wound 6 hole beads are available as shown below. All the data shown is based on the accepted winding patterns shown. From the charts notice that an extra wire-turn is very effective at the lower frequencies but the higher frequencies tend to roll-off due to the increased capacity of the extra turn. The curve for the FC561 2 hole bead is based on a horseshoe like single turn utilizing both holes.

For 2 hole and 6 hole chokes using the generally accepted winding patterns we have included the two graphs above of impedance versus frequency. To allow a comparison these curves also show the values for the **FB 101** size bead in the same material. The winding of the Stock number **FC 561** two hole core is a single horse-shoe utilising both holes.

Pre-wound chokes of 2½ turns turns are available as detailed below.



1½ turns

2½ turns

Wide Band HF Chokes (prewound)

Ferroxcube wide-band chokes offer even better performance than do shielding beads for a given space, as Figure 8 below indicates. Above 60 megacycles, the impedance is substantially resistive and constant. The chokes consist of rod-type bodies with axial holes through which wire is threaded to form a 1½-or 2½-turn coil. The chokes may be used in conjunction with small ceramic capacitors in "damping" circuits to provide additional rejection at the self-resonant frequency of the capacitor. (see fig 7 below)

Damping is defined as

$$20 \log_{10} \frac{V_1}{V_2} = 20 \log_{10} \omega C Z_\omega \quad \text{where } Z_\omega \gg \frac{1}{\omega C} \text{ and } R_L \gg \frac{1}{\omega C}$$

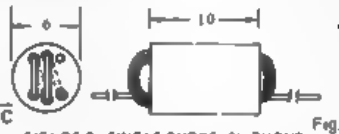


FIGURE 8 SINGLE CHOKE 2½ TURNS

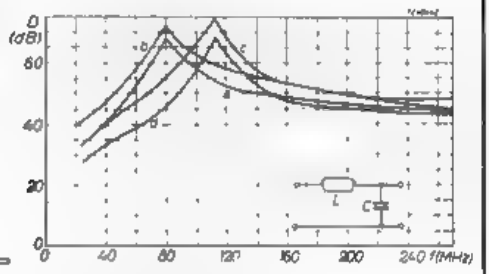


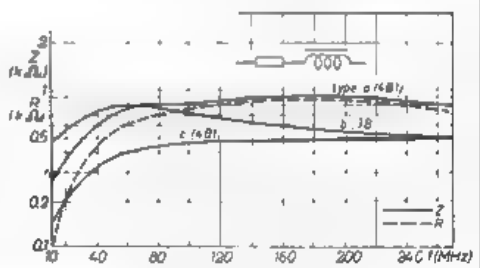
Fig. 7 Damping in an LC circuit consisting of a Ferroxcube choke and a ceramic disc capacitor

Compared with the conventional air-core suppressor chokes, a ferrite choke offers an extremely wide operating bandwidth, avoiding the sharp fall-off in impedance with slight detuning, and the vulnerability to detuning by variations in stray circuit capacitance, inherent in the wire-wound choke, the need for a parallel resistor to damp out spurious resonances is avoided as well.

STOCK No.	Philips Number	MATERIAL Grade	# of Turns	Z max K ohms	f at Zmax	Decrease of impedance in Frequency Range
FC98	4312 020 36700	4B1	2½	0.7	180mHz	50 – 300mHz 6dB 80 – 220mHz 3dB

Figure 6 shows some performance details of three single chokes. It will be noted that above approx. 80 MHz the impedance is substantially resistive and tends to be constant. Double chokes are used for twin leads, in which case the advantages of mutual inductance can be utilized. Figure 7 compares the typical obtainable performance.

b. L = 4312 020 36700 C = 1500 pF
c L = 4312 020 36700 C = 560 pF

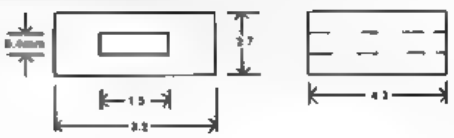


6 Performance of three single chokes.

Amidon Surface Mount Ferrite Bead Choke

43 Mix Actual Size

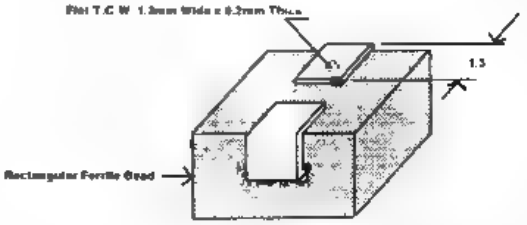
AMIDON Associates



For compactness and ease of handling wherever a bead type choke is called for the **STOCK NO FC627** Surface Mount Ferrite Bead Choke is the answer. Its compact size makes it ideal for modern compact circuitry and its conventional bead construction make it far cheaper than chip inductors with the added benefit of superior high frequency performance.

Applications for which the **FC627** has been successfully used include DC feed chokes for MOSFET bias and MMIC amplifier supplies, bias chokes for UHF microwave amplifiers, noise suppression on computer PC B's and it is potentially useful wherever a ferrite bead would be used.

Typical Impedance is 42 ohms at 100MHz (measured on a HP 4191A RF Impedance Analyzer



AMIDON R.F.I. Suppression Ferrites

On this page we have listed a range of Ferrite Beads, Ferrite Toroidal Cores, Split Ferrite Beads and Split Ferrite Bars, all of which are extensively used for RFI problems. Most of these items are also listed elsewhere in this catalogue.

The large Ferrite Beads and Toroidal Cores can be used to reduce RF sometimes found on the outer shield of coaxial cable and microphone cables. Also they are of considerable value for the suppression of unwanted RF in unshielded wire bundles, speaker leads, AC wireing leads, etc.

In many applications only one pass of the wire through the core will provide sufficient attenuation of the unwanted RF, though in other cases, such as AC leads, multiple turns will be necessary.

Split Ferrite Beads are now available for use on computer ribbon-cable. Because of the two section feature of these bars, they can easily be applied to a ribbon-cable without removing the end plug.

Ferrite Toroidal Cores, Ferrite Beads and Ferrite Split Cores can be very usefull in the suppression of unwanted RF, but they are not a cure-all. There are several types of noise and the methods used to help combat them are quite different.

In some cases it is difficult to determine the spectral content of the noise, in equipment such as computers, diathermy, flashing signs, etc. square waves are common and much of the energy is in the very high frequency ranges. For these applications material **Mix 43** is generally the most suitable.

For interference in the range up to 30MHz the material **Mix 73** is generally the most effective, however in some applications below 1MHz material **Mix 75** (see Ferrite Toroid page) may be more suitable. With **Mix 73** cores, use a maximum of 15 turns for most effective results. Reduce the number of turns as the frequencies increase.

Material **Mix 43** will generally provide best results in the range 30MHz to 100MHz. We suggest you try 5 - 9 turns as a starting point in this range. Above 100MHz **Mix 43** is probably still the best. Above 200MHz we suggest you use only one turn. Several suppression chokes may be used in cascade to increase suppression at any given range of frequencies or to provide broader coverage.

When computers are the offenders generating the noise a variety of possible solutions offer themselves. The power cord can be wound several times through an **FC617** core to prevent noise travelling down the power lines. Terminal cables etc. can be fed through a standard bead or a Split Bead clamped around them. Ribbon cables may be fed through the new Split Slab materials designed specifically for that application.

But remember that although use of ferromagnetic materials to suppress noise can be very effective if your equipment or computer has ineffective shielding, all these efforts may be in vain.

It should be noted that Ferrite Cores will **NOT** be effective in suppressing ignition noise or noise from light dimmers. Light dimmers seem to respond best to individual filtering of power lines with high-saturation materials such as **Mix 26** Iron Powder Material.

Pi Section EMI Filters

Ceramic πFilters are chosen to suppress undesired **EMI** in those applications where space is limited and small size is critical. Popular applications include telecommunications, CATV, telemetry, radar and other transmission equipment.

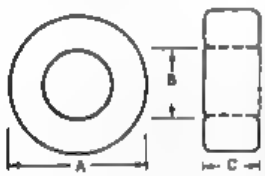
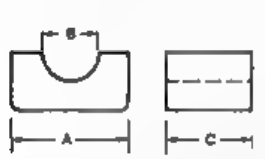
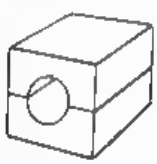
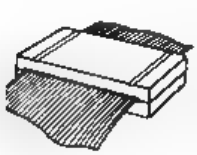
Dielectric Withstand Voltage two times the DC working voltage applied between either terminal and case. **Insulation Resistance** Measured at 25°C ± 2°C with 100VDC and charging current limited to 50mA max. The IR after 2 minutes max. shall be a minimum of 10,000 mΩ. **Insertion Loss** Listed is a measurement of filter performance in a matched 50Ω. It is recommended to verify performance under actual circuit conditions. **Environmental Tests** filters meet all applicable environmental requirements of MIL-F-15733. **Current Idc** 10 ampers.

π FILTER

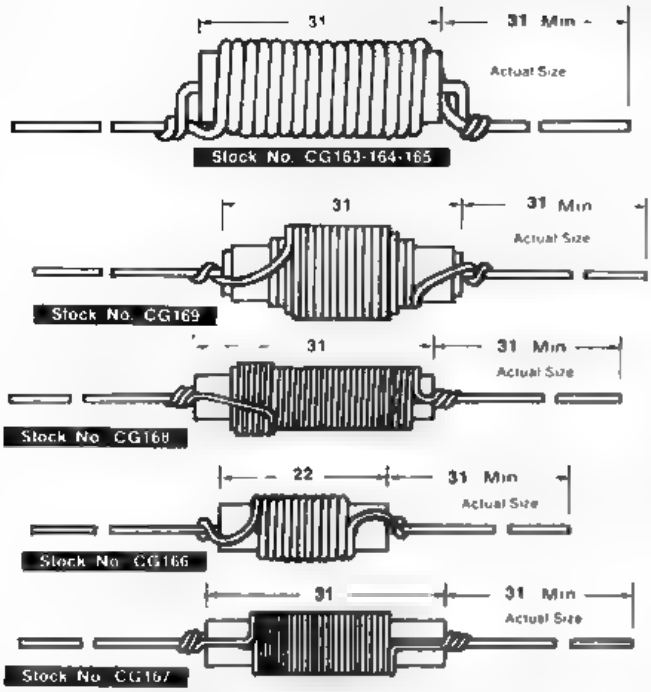
This range of feed-thru Capacitors with built in Ferrite beads forming a Pi-Section is listed in more detail in the resistor-capacitor section of this catalogue.

HOW TO ORDER

Stock No.	Min. Cap. (pF)	Working Voltage (WVDC) 85°C	125°C	Current Idc(A)	Minimum No load insertion Loss (db) at 25°C per MIL-Std-220 10 MHz	100 MHz	1 GHz	10 GHz
CC01	1000	350	200	10	5	45	70	70
CC02	1750	250	125	10	5	50	60	60
CC03	3000	350	200	10	4	55	65	65
CC04	1000	350	200	10	5	45	70	70
CC05	5000	200	100	10	20	65	70	70

	STOCK No.	AMIDON No	MATERIAL Mix No.	DIMENSIONS (mm) A outer diam.	B inner diam.	C height	TYPICAL IMPEDANCE (ohms) for one pass of conductor through core For total Z x by turns² 25MHz	100MHz	
	FC501	FT-114-43	43	29.01	19.05	7.50	27	47	
	FC503	FT-114-72	72	29.01	19.05	7.50	35	29	
	FC564	FT-140-43	43	35.56	22.86	12.70	47	75	
	FC566	FT-140-72	72	35.56	22.86	12.70	62	50	
	FC517	FT-240-43	43	60.96	35.56	12.70	68	105	
	FC519	FT-240-72	72	60.96	35.56	12.70	78	66	
	FC623	2x-43-251	43	14.99	6.35	28.58	171	275	
	FC624	2x-43-151	43	25.91	12.70	28.58	159	245	
	FC484	FT-50B-43	43	12.70	7.93	12.7	56	80	
	FC486	FT-50B-72	72	12.70	7.93	12.70	74	60	
	FC556	FB-43-1020	43	25.40	12.70	20.45	155	235	
	FC557	FB-77-1024	77	25.40	12.70	20.98	185	135	
	FC552	FB-43-5621	43	14.28	6.35	28.58	171	250	
	FC553	FB-77-5621	77	14.28	6.35	28.58	270	215	
	FC554	FB-43-6301	43	9.53	4.93	19.42	55	48	
	FC555	FB-77-6301	77	9.53	4.93	19.42	73	58	
	FC625	2x-43-851	43	for 2" flat ribbon cable			105	285	
	FC626	2x-43-051	43	for 2.5" flat ribbon cable			90	250	

J.W.Miller HASH Chokes



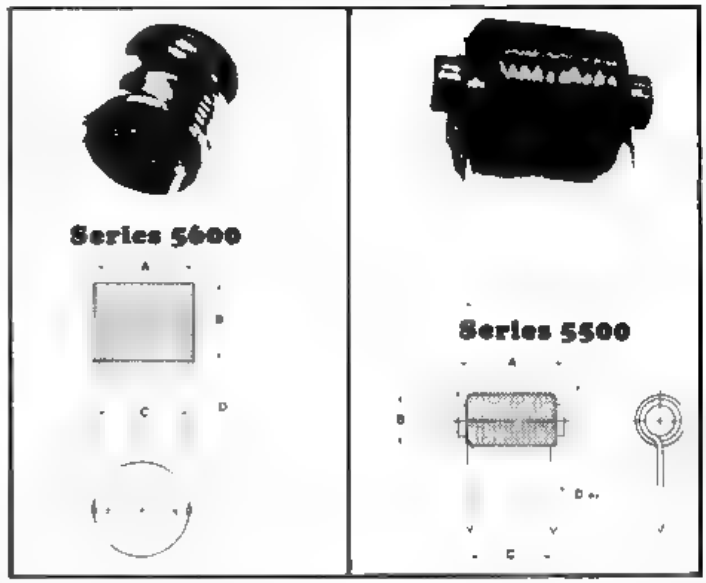
J.W Miller 52 Series axial leaded Hash chokes are a series of inductors designed for **RFI/EMI** suppression applications, but may also be used for SWITCH—MODE power (SMPS) Energy storage applications. Their conservative design and large size coupled with an open magnetic path makes them suitable for any design where high DC currents will be encountered. All 52 Series hash chokes are varnished impregnated.
Core Material CG163-164-165 Iron. CG166-167-168-169 Ferrite

52 Series —

STOCK No	Miller Number	L ± 20%	R.dc Ohms MAX	I.dc Amp. MAX	DIA. MAX.(mm)	WIRE SIZE
L measured on Q-meter at 7.90 MHz —						
CG163	5218	3.35 µH	0.01	20	15	AWG 12
CG164	5219	4.9 µH	0.016	15	15	AWG 14
CG165	5220	6.8 µH	0.021	10	14	AWG 16
CG166	5230	4.0 µH	0.012	8	10	AWG 20
L measured on 1 kHz bridge —						
CG167	5240	40 µH	0.062	3	8	AWG 20
CG168	5250	100 µH	0.218	2	10	AWG 20
CG169	5254	250 µH	0.17	2.5	11	AWG 20

High-Flux-Density Ferrite Rods & Bobbins

J W Miller Series 5500/5600 high saturation density inductors for **RFI/EMI** filtering and energy storage inductors in Switching Power Supplies (SMPS) applications. With an open magnetic circuit they offer higher current densities than similar toroidal inductors but without the inherent shielding of toroidal construction. All series 5500 5600 inductors are covered with heat-shrink tubing and are varnish impregnated. Suitable for PCB mounting. The inductance is measured at 1 kHz with no DC current applied — inductance change is typically 5% at twice maximum rated current. Leads are 25.40mm long and are tinned to within 3mm of the body.



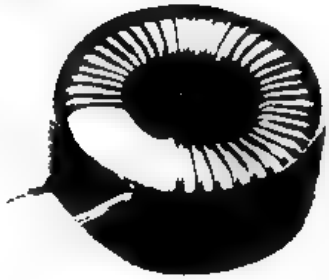
5500 Series — Ferrite Rod Style —

STOCK No	Miller Number	L ± 10%	SRF (Fo) MHz MIN	R.dc Ohms MAX.	I.dc Amp MAX	DIM. A	DIM. B	DIM. C	DIM. D
CG170	5501	5	33.4	0.013	10	22.35	6	12.7	1.06
CG171	5502	10	21.6	0.017	9	28.50	16	17.5	
CG172	5503	27	9.6	0.030	7	22.35	20.50	11.00	
CG173	5504	50	3.44	0.045	5.5	28.5		19.05	
CG174	5505	100	2.00	0.061	4.8	28.5		24.00	
CG175	5506	156	1.84	0.068	4.6	35.00		27.00	
CG176	5507	256	1.1	0.088	4	41		32	

5600 Series — Ferrite Bobbin Style —

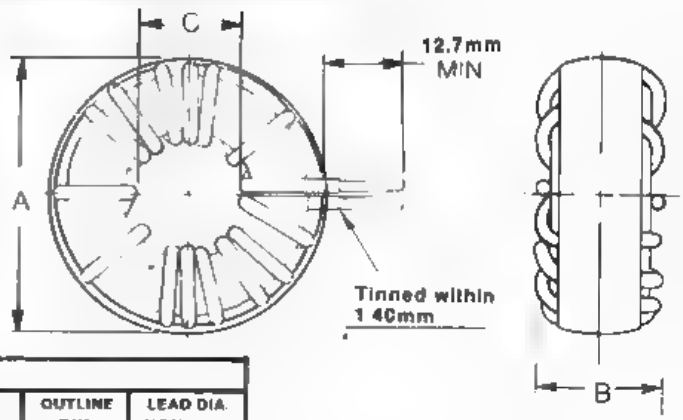
STOCK No	Miller Number	L ± 10%	SRF (Fo) MHz MIN	R.dc Ohms MAX.	I.dc Amp MAX	DIM. A	DIM. B	DIM. C	DIM. D
CG177	5601	5	24.7	0.007	15	21	23	15	1.85
CG178	5602	10	17.4	0.009	14				
CG179	5603	25	6.2	0.022	9			14.5	1.06
CG180	5604	50	4.1	0.034	6.6			16.5	
CG181	5605	100	2.4	0.072	4.5			17.5	
CG182	5606	250	1.8	0.173	2.9			16.5	

J.W.Miller 5700 Series High Current Toroid Inductors



Miller

J W Miller Series 5700 High current toroidal inductors have the advantage of providing inherent magnetic field containment in any **RFI/EMI** or as energy storage inductors in **Switch Mode Power Supply (SMPS)** applications. Unfortunately they are not able to offer the same current density or low inductance change as the open magnetic circuit types shown above. Care should be taken when designing with these inductors to allow for inductance variation with high current.
They are covered with heat-shrink tubing and are varnish impregnated.



5700 — Series — High Current Toroids —

STOCK No	Miller Number	L_o at 0 ADC µH ± 15%	RATED DC Amps	DC Res. at RATED DC	MIN Ind. µH Ohms MAX	DC Amp for 0.8 L_o	OUTLINE DIM.	LEAD DIA. NOM. (mm)
CG183	5701	10	11.00	5	0.003	7.50	1	1.6
CG184	5702	25	5.50	12	0.012	3.25	1	1.90
CG185	5706	25	9.00	15	0.012	5.50	2	1.6
CG186	5707	75	5.00	40	0.03	3.00	2	0.9
CG187	5703	125	2.75	70	0.12	1.50	1	0.90
CG188	5704	275	2.00	150	0.24	1.30	1	0.40
CG189	5708	400	2.25	225	0.33	1.40	2	0.45
CG190	5705	450	1.50	250	0.49	0.80	1	0.30
CG191	5710	1000	1.50	575	0.96	0.90	2	0.30

OUTLINE DIM. (mm)	MAX. A	MAX. B	MIN. C
"1"	22	11	5
"2"	28	14	8

AMIDON L33 Series Shielded Coil Form Assemblies

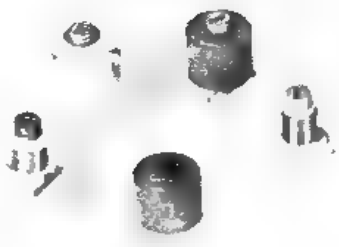
Sub-Miniature Adjustable Inductors easily Wound on Shielded Coil Form Assemblies

The AMIDON L33 series tunes from both top and bottom and is supplied as a kit comprising – Shielding can (copper tin plated) Cup core for magnetic shielding of same material as core for maximum efficiency at operating frequency Core to provide adjustment of inductance Nylon winding bobbin -Moulded plastic base with 5 contacts to accommodate centre tapped coil ON one winding only Five pieces in all

They are most efficient when tuning slug is set at maximum L For tuning flexibility calculate so that slug will be about 90% maximum L when at operating frequency

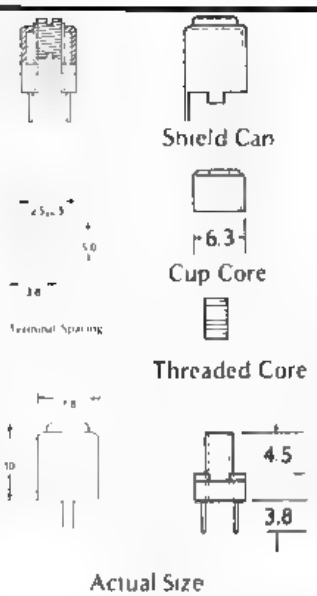
Solid magnet wire may be substituted for Litz wire but somewhat lower Q may result

Frequency Range 10kHz to 200mHz Inductance Range .08 to 180uH



$$\text{Turns} = 100\sqrt{\frac{\text{desired 'L' (uh)}}{90\%\ A_L\ (\text{uh}/100\ \text{turns})}}$$

STOCK No.	AMIDON No.	Iron Grade & Colour Code	Frequency Range	A_L(uH/100t) at Max. L	L ratio Max. to Min.	Typical Winding (mid-freq.) Wire	Turns	L µH	Q Max
FC600	L33-1	1 Blue	300kHz 1mHz	75	17 / 1	3/44	75	42.5	80
FC601	L33-2	2 Red	1 10mHz	65	15 / 1	9/44	40	10.9	90
FC602	L33-3	3 — Gray	100 500kHz	80	18 / 1	3/44	150	180	70
FC603	L33-6	6 — Yellow	10 50mHz	60	15/1	26	7	0.36	100
FC604	L33-10	10 — Black	25 - 100mHz	54	14/1	26	5	0.18	120
FC605	L33-12	12 — Green	50 200mHz	48	13/1	26	3	0.08	130



AMIDON L43 Series Shielded Coil Form Assemblies

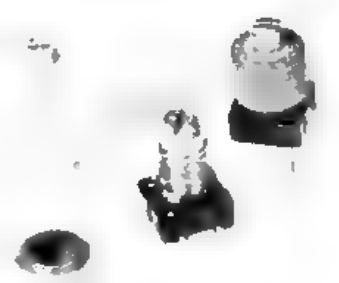
Miniature Adjustable Inductors easily Wound on Shielded Coil Form Assemblies

The AMIDON L43 series tunes from both top and bottom and is supplied as a kit comprising – Shielding can (copper tin plated) Cup core for magnetic shielding of same material as core for maximum efficiency at operating frequency Core to provide adjustment of inductance Nylon winding bobbin Moulded plastic base with 5 contacts to accommodate centre tapped coil ON one winding only – Five pieces in all

They are most efficient when tuning slug is set at maximum L For tuning flexibility calculate so that slug will be about 90% maximum L when at operating frequency

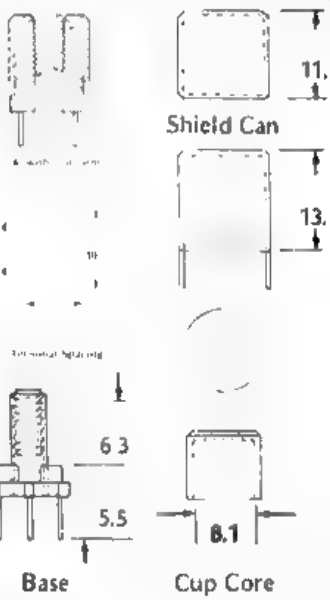
Solid magnet wire may be substituted for Litz wire but somewhat lower 'Q' may result

Frequency Range 200kHz to 200mHz — Inductance Range 0.02 to 700 uH



$$\text{Turns} = 100\sqrt{\frac{\text{desired 'L' (uh)}}{90\%\ A_L\ (\text{uh}/100\ \text{turns})}}$$

STOCK No.	AMIDON No.	Iron Grade & Colour Code	Frequency Range	A_L(uH/100t) at Max. L	L ratio Max. to Min.	Typical Winding (mid-freq.) Wire	Turns	L µH	Q Max.
FC594	L43-1	1 — Blue	300kHz - 1mHz	115	1.8/1	5/44	149	230	110
FC595	L43-2	2 — Red	1 - 10mHz	98	1.8/1	9-44	21	4	120
FC596	L43-3	3 — Gray	100 - 500kHz	133	1.8/1	3/44	223	800	90
FC597	L43-6	6 — Yellow	10 - 50mHz	85	1.4/1	26	6	.30	130
FC598	L43-10	10 — Black	25 - 100mHz	72	1.3/1	24	5	0.14	150

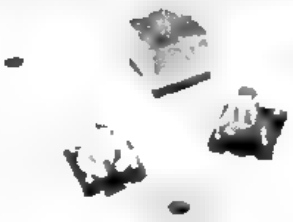


AMIDON L57 Series Shielded Coil Form Assemblies

Adjustable Inductors easily Wound on Shielded Coil Form Assemblies

The AMIDON L57 series tunes from both top and bottom and is supplied as a kit comprising – Shielding can (copper tin plated) Cup core for magnetic shielding of same material as core for maximum efficiency at operating frequency - Core to provide adjustment of inductance Nylon winding bobbin -Moulded plastic base with 6 contacts to accommodate centre tapped coils Five pieces in all

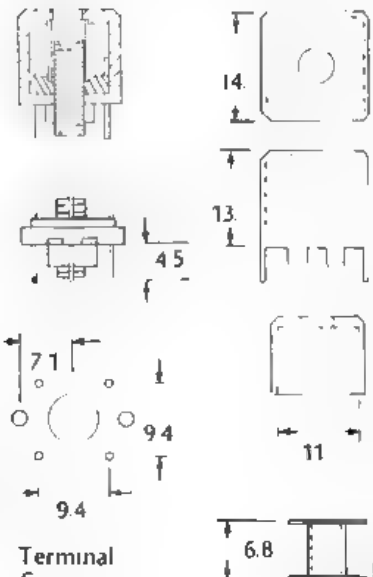
They are most efficient when tuning slug is set at maximum L For tuning flexibility calculate so that slug will be about 90% maximum L when at operating frequency



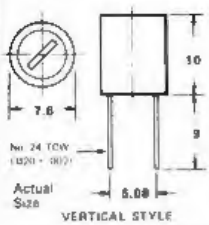
$$\text{Turns} = 100\sqrt{\frac{\text{desired 'L' (uh)}}{90\%\ A_L\ (\text{uh}/100\ \text{turns})}}$$

STOCK No.	AMIDON No.	Frequency Range	A_L (u/100t) at Max. L	Iron Grade & Colour Code	Tuning Range
FC606	L57-1	300kHz - 1mHz	175µH	1 — Blue	3 / 1
FC607	L57-2	1 - 10mHz	125µH	2 — Red	2 / 1
FC608	L57-3	10 500kHz	204µH	3 — Gray	3 / 1
FC609	L57-6	10 50mHz	115µH	6 — Yellow	2 / 1
FC610	L57-10	25 - 100mHz	100µH	10 — Black	2 / 1
FC611	L57-12	50 150mHz	67µH	12 — Green	1.5 / 1

AMIDON Associates



J.W.Miller Variable Inductors (RF Coils)



VERTICAL STYLE

Shielded — Adjustable — Inductors
Reference: MIL-C-15305
MS 21381, MS 21402

J.W.Miller VLS Series Variable Inductors Subminature, shielded for high density circuits. PCB mounting on standard 0.1" (5.08mm) lead spacing. Leads are #20 TCW (0.5mm) tinned copper wire with a length of 9mm. Terminal pull strength of 1.3kG. **Tunable Range** CG200 & CG201 ± 5% — all other values ± 10% : **Q & Fo** Not less than 80% tabled value at L Nom. : **Working Voltage** 300 Vdc **Incremental Current** to cause 5% inductance reduction maximum **Operating Temperature** —55°C to +125°C :

STOCK No.	MILLER No.	L Nom. µH	TEST Freq. MHz	Q Nom.	Fo Nom. HMZ	R,dc 25°C,Max Ohms	I,dc Max. mA	Incr I,dc mA
CG200	VLSR10	0.1µH	25MHz	70	>250	0.03	2500	2500
CG201	VLSR12	0.12µH	25	70	>250	0.03	2500	2500
CG202	VLSR15	0.15µH	25	70	>250	0.03	2500	2500
CG203	VLSR18	0.18µH	25	70	>250	0.035	2400	2400
CG204	VLSR22	0.22µH	25	70	>250	0.036	2300	2300
CG205	VLSR27	0.27µH	25	80	>250	0.04	2200	2200
CG206	VLSR33	0.33µH	25	80	>250	0.04	2200	2200
CG207	VLSR39	0.39µH	25	80	250	0.045	2100	2100
CG208	VLSR47	0.47µH	25	80	230	0.045	2100	2100
CG209	VLSR56	0.56µH	25	80	220	0.05	2000	2000
CG210	VLSR68	0.68µH	25	80	190	0.055	1900	1900
CG211	VLSR82	0.82µH	25	85	160	0.06	1800	1800
CG212	VLS1R0	1.0µH	25	85	160	0.07	1700	1700
CG213	VLS1R2	1.2µH	7.9	80	170	0.085	16700	16700
CG214	VLS1R5	1.5µH	7.9	100	155	0.1	1540	1540
CG215	VLS1R8	1.8µH	7.9	115	135	0.11	1470	1470
CG216	VLS2R2	2.2µH	7.9	110	120	0.12	1410	1410
CG217	VLS2R7	2.7µH	7.9	110	104	0.125	1380	1380
CG218	VLS3R3	3.3µH	7.9	90	93	0.156	1200	1200
CG219	VLS3R9	3.9µH	7.9	90	87	0.18	1135	1135
CG220	VLS4R7	4.7µH	7.9	95	78	0.245	986	986
CG221	VLS5R6	5.6µH	7.9	90	72	0.286	950	950
CG222	VLS6R8	6.8µH	7.9	85	63	0.33	853	853
CG223	VLS8R2	8.2µH	7.9	90	60	0.46	720	720
CG224	VLS100	10µH	2.5	120	37	0.6	545	545
CG225	VLS120	12µH	2.5	120	37	0.8	545	545
CG226	VLS150	15µH	2.5	120	28.8	0.885	520	520
CG227	VLS180	18µH	2.5	115	23.9	0.94	504	504
CG228	VLS220	22µH	2.5	125	21.3	1.03	480	480
CG229	VLS270	27µH	2.5	118	20.8	1.18	418	418
CG230	VLS330	33µH	2.5	120	18.6	1.3	398	398
CG231	VLS390	39µH	2.5	120	17.7	1.41	386	386
CG232	VLS470	47µH	2.5	110	14.9	1.61	360	350
CG233	VLS560	56µH	2.5	115	13.9	2.09	330	330
CG234	VLS680	68µH	2.5	105	12.9	2.2	320	320
CG235	VLS820	82µH	2.5	105	11.7	2.42	300	300
CG236	VLS101	100µH	2.5	95	10.5	2.16	333	333
CG237	VLS121	120µH	0.79	95	5.9	2.36	316	190
CG238	VLS151	150µH	0.79	90	5.2	2.52	306	175
CG239	VLS181	180µH	0.79	95	4.9	2.88	286	150
CG240	VLS221	220µH	0.79	95	4.6	3.18	237	125
CG241	VLS271	270µH	0.79	100	4.2	3.5	200	120
CG242	VLS331	330µH	0.79	100	3.65	4.8	222	110
CG243	VLS391	390µH	0.79	100	3.45	5.44	209	105
CG244	VLS471	470µH	0.79	100	3.2	5.9	201	100
CG245	VLS561	560µH	0.79	95	2.8	6.3	194	90
CG246	VLS681	680µH	0.79	100	2.7	7.2	181	80
CG247	VLS821	820µH	0.79	90	2.5	8	172	70
CG248	VLS102	1,000µH	0.79	100	2.35	12	141	65
CG249	VLS122	1,200µH	0.25	95	2.2	13.5	132	60
CG250	VLS152	1,500µH	0.25	90	1.9	16.5	119	55
CG251	VLS182	1,800µH	0.25	100	1.8	18	114	47
CG252	VLS222	2,200µH	0.25	100	1.7	20.5	107	43
CG253	VLS272	2700µH	0.25	95	1.5	22.5	102	39
CG254	VLS332	3,300µH	0.25	90	1.4	42	78	36
CG255	VLS392	3,900µH	0.25	85	1.37	47.5	71	35
CG256	VLS472	4,700µH	0.25	85	1.24	53	67	34
CG257	VLS562	5,600µH	0.25	85	0.93	62.5	65	31
CG258	VLS682	6,800µH	0.25	75	0.79	69.5	58	27
CG259	VLS822	8,200µH	0.25	80	0.75	75	58	29
CG260	VLS103	10,000µH	0.25	70	0.70	100	49	34
CG261	VLS123	12,000µH	0.079	70	0.60	84	60	40
CG262	VLS153	15,000µH	0.079	70	0.38	84	52	34
CG263	VLS183	18,000µH	0.079	70	0.36	93	50	30
CG264	VLS223	22,000µH	0.079	70	0.32	104	45	28
CG265	VLS273	27,000µH	0.079	70	0.30	173	35	25
CG266	VLS333	33,000µH	0.079	70	0.27	187	32	24
CG267	VLS393	39,000µH	0.079	70	0.38	220	30	22
CG268	VLS473	47,000µH	0.079	70	0.28	253	30	20
CG269	VLS563	56,000µH	0.079	70	0.24	285	26	18
CG270	VLS683	68,000µH	0.079	60	0.20	311	24	18
CG271	VLS823	82,000µH	0.079	60	0.19	385	22	16
CG272	VLS104	100,000µH	0.79	60	0.17	420	20	15

J.W.Miller Adjustable RF Coils

Actual Size

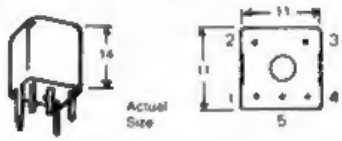
J.W.Miller 48A Series adjustable RF coils are intended for operation from 10 — 450 MHz. The construction of the coils is unusual in that the former of Polypropylene is actually moulded within a prewound coil, this relives the stress on the winding and reduces the ability of the winding to move. Thus these coils have unsurpassed stability, uniformity of electrical parameters and are very low in microphonics. They may easily be tapped if required.
Frequency Range 10 to 450 MHz : **Form Length** 18.50mm : **OD at Base 16.00mm : Lead Spacing (PCB)** 10.36mm : **Wire Size** AWG 20 tined copper : **Core** 10-32 x 9.5mm Carbonyl J : **Current (I) DC MAX** 2 Amp

48A Series —

STOCK No	Miller Number	L µH MIN.	L µH NOM.	L µH MAX.	Q MIN.	No. of TUTNS
CG100	48A518MPC	0.046	0.015	0.055	100	1½
CG101	48A778MPC	0.071	0.077	0.082	100	2½
CG102	48A117MPC	0.099	0.111	0.122	100	3½
CG103	48A147MPC	0.118	0.138	0.157	100	4½
CG104	48A187MPC	0.15	0.179	0.207	100	5½
CG105	48A227MPC	0.181	0.215	0.276	100	6½
CG106	48A257MPC	0.206	0.246	0.283	100	7½
CG107	48A287MPC	0.241	0.284	0.316	100	8½
CG108	48A317MPC	0.270	0.311	0.351	100	9½

J.W.Miller Shielded Adjustable RF Coils

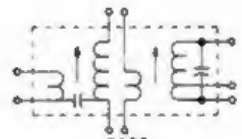
J.W.Miller 9100 Series ultra-compact adjustable coils provide a compact, well shielded slug tuned coil in larger inductance values than can be realised with the 48A or 75F types. They are wound on an **Amidon** L43 coil former set. These inductors may have windings added but the existing winding cannot be tapped. Magnetic shielding is provided by cup cores in the assembly and a copper shield can provides electrostatic shielding.
— See **Amidon** L43 series in the ferrite section of this catalogue for mechanical dimensions —
Tuning is accessible from either the top or bottom of the assembly. These coils are suitable for aplications between 10 kHz and 200 MHz



9100 Shielded Series —

STOCK No	Miller Number	L µH MIN.	L µH MAX	Q L MIN.	Q L MAX.	I.MAX. DC mA	DC res. OHMS	SRF MHz
CG132	9108	1.44	2.94	34	54	417	1.38	64
CG133	9109	2.52	5.7	40	77	368	1.76	60
CG134	9110	5.35	13.5	50	69	286	2.92	37
CG135	9111	12.5	29.4	31	60	225	4.72	9.7
CG136	9112	26.3	71.25	35	54	185	6.97	5.1

J.W.Miller Transistor Radio Transformers



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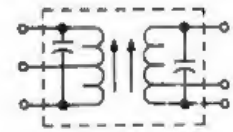


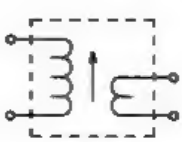
$133

Radio IF Transformers —

STOCK No.	MILLER No.	Frequency	Specifications	Dimensions (mm)	PIN OUT
CG137	2085	455kHz	50K - 800Ω	10 x 13	857
CG138	2088	455kHz	20K - 5KΩ	10 x 13	857
CG139	8807	455kHz	6dB - 25kHz	10 x 20 x 13	8166
CG140	8851	10.7MHz	6dB - 300kHz	10 x 20 x 13	8133
CG141	8852	10.7mHz	100k - 300Ω	10 x 13	841
CG142	8853	10.7mHz	20K - 800Ω	10 x 13	852

Oscillator Coils — 540 — 1650 kHz Broadcast Band

STOCK No.	MILLER No.	Frequency F	L µH	Tuning Cap (pF)	Dimensions (mm)	PIN OUT
CG143	2085	455kHz	220-300	75-110pF	10 x 13	852



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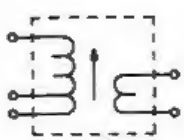

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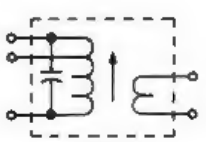


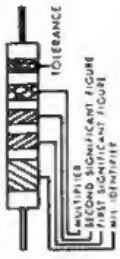
$57

J.W. Miller Axial Lead RF Chokes

J.W.Miller Series 9310 are general purpose moulded RF chokes in standard axial lead bodies with tinned copper leads 0.70mm (22AWG) DIA. **Temperature Range** -55°C to +125°C for values 0.15 µH to 0.47 µH and -55°C to +105°C for 5.6 µH to 33 µH. **Reference:** MIL-C 15305, MS14046, MS18130, MS16225.
Series 9210 is an extended value range of the **9310** family. **Temperature Range** -55°C to +100°C. **Reference:** MIL-C-15305, MS90583.

9310 — 9210 Series —

STOCK No	Miller Number	L ± 20%	SRF (Fo) MHz MIN.	R,dc Ohms MAX.	I,dc mA MAX
CG01	9310-00	0.15µH	525	0.03	2450
CG02	9310-02	0.22µH	450	0.055	1900
CG03	9310-04	0.33µH	380	0.09	1480
CG04	9310-06	0.47µH	310	0.12	1225
		L ± 10%			
CG05	9310-07	0.56µH	280	0.135	1220
CG06	9310-08	0.68µH	250	0.15	1100
CG07	9310-10	0.82µH	220	0.22	900
CG08	9310-12	1.0µH	200	0.29	830
CG09	9310-14	1.2µH	180	0.42	680
CG10	9310-16	1.5µH	160	0.5	660
CG11	9310-18	1.8µH	150	0.66	635
CG12	9310-20	2.2µH	135	0.95	436
CG13	9310-22	2.7µH	120	1.20	385
CG14	9310-24	3.3µH	110	2.0	300
CG15	9310-26	3.9µH	100	2.3	280
CG16	9310-28	4.7µH	90	2.6	260
CG17	9310-30	5.6µH	80	0.32	750
CG18	9310-32	6.8µH	65	0.8	600
CG19	9310-34	8.2µH	60	0.8	545
CG20	9310-36	10µH	45	0.9	445
CG21	9310-38	12µH	43	1.1	404
CG22	9310-40	15µH	40	1.4	370
CG23	9310-42	18µH	34	2.25	280
CG24	9310-44	22µH	30	2.5	295
CG25	9310-46	27µH	26	2.5	255
CG26	9310-48	33µH	25	2.6	250
		L ± 20%			
CG27	9210-56	39µH	14.6	2.6	178
CG28	9210-60	47µH	13.0	2.75	170
CG29	9210-64	56µH	12.0	3.0	164
CG30	9210-66	68µH	11.8	3.3	156
CG31	9210-72	82µH	10.3	3.9	143
CG32	9210-76	100µH	9.5	4.5	133
CG33	9210-80	120µH	8.7	5.2	124
CG34	9210-84	150µH	8.0	6.05	114
CG35	9210-88	180µH	7.0	6.75	108
CG36	9210-92	220µH	6.2	7.45	103



Series 9220 moulded RF chokes are larger in physical size than the 9310, 9210 series with tinned copper leads 0.70mm (22AWG) DIA. They offer values from 270 µH to 1000 µH. **Reference:** MIL-C-15305, MS90539, MS90540, MS90541.

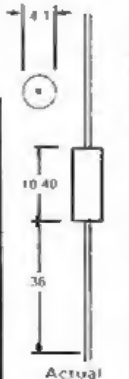
9220 Series —

STOCK No	Miller Number	L ± 20%	SRF (Fo) MHz MIN.	R,dc Ohms MAX.	I,dc mA MAX
CG37	9220-00	270µH	5.8	6.2	110
CG38	9220-04	330µH	5.0	9.1	105
CG39	9220-08	390µH	4.5	10.0	100
CG40	9220-12	470µH	3.8	12.3	91
CG42	9220-20	680µH	3.4	13.7	85
CG43	9220-24	820µH	3.1	15.1	81
CG44	9220-28	1000µH	2.8	16.5	78

J.W.Miller 9250 series RF chokes. This range of axial leaded RF chokes offers a range of high value inductors a standard moulded housing. This range extends and supplement the standard moulded RF choke range giving values up to 100 mH. They are electricaly equivalent 9310 & 9220 choke range listed above. They are wound on a Ferrite core for small size. **Dielectric Strength** 1000 Vac per MIL-STD-202 method 302 : **Insulation resistance** 1000 Megohms minimum per MIL-STD-202 method 302 : **Coating** Flame retardant epoxy : **Lead** Tinned copper 0.70mm DIA.

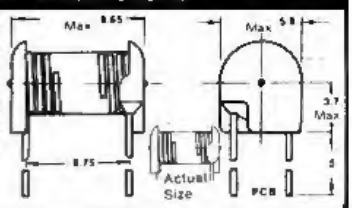
9250 Series —

STOCK No	Miller Number	L ± 10%	SRF (Fo) MHz MIN.	R,dc Ohms MAX.	I,dc mA MAX
CG120	8250-155	1.5mH	1.2	20.5	55
CG121	8250-225	2.2mH	0.97	23.8	50
CG122	8250-335	3.3mH	0.84	53.0	40
CG123	8250-475	4.7mH	0.74	81.6	31
CG124	8250-685	6.8mH	0.66	111.0	27
CG125	8250-106	10mH	0.47	137	24
CG126	8250-156	15mH	0.29	157	22
CG127	8250-226	22mH	0.25	274	17
CG128	8250-336	33mH	0.19	343	15
CG129	8250-476	47mH	0.16	473	13
CG130	8250-686	68mH	0.13	580	12
CG131	8250-107	100mH	0.11	678	11



J.W.Miller Air-Core RF-Inductors

J.W.Miller 75F series of inductors have unsurpassed stability and uniformity of electrical parameters. A plastic form of Polypropylene is moulded around an accurately positioned winding. This form of construction relieves the stress on the winding and reduces the ability of the winding to move. Thus these coils are exceptionally stable and low in microphonics. They are especially useful for equipment operation in the 50—450 MHz range.

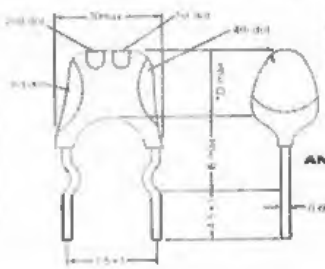


75F Series —

STOCK No	Miller Number	L ± 20%	Q MIN.	I,dc mA MAX	WIRE SIZE	PCB(mm)	No. TURNS
CG109	75F23MPC	0.023 µH	110	1,000	AWG 22	3.75	2½
CG110	75F32MPC	0.032 µH	110	1,000	AWG 22	3.75	3½
CG111	75F51MPC	0.051 µH	110	1,000	AWG 22	3.75	4½
CG112	75F117MPC	0.11 µH	110	1,000	AWG 22	3.75	8½
CG113	75F157MPC	0.15 µH	110	1,000	AWG 22	3.75	10½
CG114	75F217MPC	0.27 µH	110	500	AWG 26	4	14½
CG115	75F397MPC	0.39 µH	110	500	AWG 26	4	15½
CG116	75F477MPC	0.47 µH	110	500	AWG 26	4	17½
CG117	75F597MPC	0.59 µH	110	500	AWG 26	4	19½

Radial Lead Epoxy-Dipped RF Chokes

AMIDON Radial series fixed inductors use ferrite cores and are designed to take advantage of the magnetic characteristics of these cores for small size. Stringent quality control is upheld in Amidon's automated fixed inductor production for assuring the uniformity of product quality and reliability. They are high in cost performance. Large inductance for small size. **Temperature Rise** 20°C ; **Ambient Temperature** 60°C ; **Rated Voltage 250 volts DC** ; **Minimum "Q"** 30.
Features Moulded, epoxy-coated, radial lead wires. Minimum distributed capacitance with good moisture resistant properties. High dielectric strength and insulation resistance.

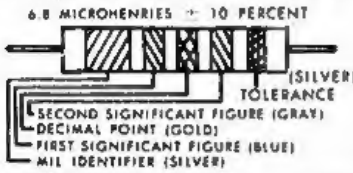


Part No	Inductance (µH)	Rated DC Current (mA)	DC Resistance Max. (ohms)	SRF min. (MHz)
CG58	0.22µH		0.5	175
CG59	0.47µH		0.5	175
CG60	1.0µH	330	0.201	96
CG61	1.2µH	320	0.218	84
CG62	1.5µH	316	0.240	71
CG63	1.8µH	310	0.267	62
CG64	2.2µH	300	0.280	53
CG65	2.7µH	295	0.316	46
CG66	3.3µH	285	0.353	40
CG67	3.9µH	280	0.378	35
CG68	4.7µH	275	0.420	31
CG69	5.6µH	270	0.450	27
CG70	6.8µH	260	0.458	23
CG96	8.2µH	255	0.540	22
CG71	10µH	250	1.14	20
CG72	15µH	235	1.40	13
CG73	18µH	225	1.55	12
CG74	22µH	220	1.73	10
CG75	27µH	215	1.85	9
CG76	33µH	205	2.15	8
CG77	39µH	200	2.36	7
CG78	47µH	190	1.94	9
CG79	56µH	180	1.95	9
CG80	68µH	170	2.12	8
CG97	82µH	160	2.40	6
CG81	100µH	150	2.85	7
CG82	120µH	145	4.35	6
CG83	150µH	130	3.60	5
CG84	180µH	120	4.02	4
CG85	220µH	115	4.70	4
CG86	270µH	105	5.40	3
CG87	330µH	100	7.50	3
CG88	390µH	90	8.55	3
CG89	470µH	85	9.90	2.6
CG90	560µH	80	11.4	2.5
CG91	680µH	68	10.6	2.3
CG98	820µH	58	12.3	2.1
CG92	1,000µH	58	14.1	1.9
CG93	1,200µH	50	17	2.2
CG94	1,500µH	50	16	1.8
CG99	1,800µH			
CG95	2,200µH	50	16	1.6

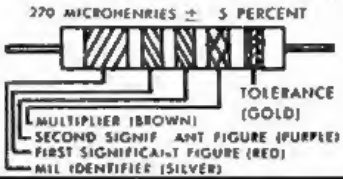
COLOR CODING for MOLDED CHOKES per MIL-C-15305

For cylindrical choke coils Cylindrical choke coils shall be marked with five colored bands. A silver band MIL identifier of double the width of the other four bands, located near one end of the coil, identifies military radio-frequency coils; four other bands of equal width, three indicating the inductance in microhenries and the fourth band indicating the tolerance in percent. Color coding shall be in accordance with the color code of table. When either the first or second band of the three bands is gold, this band shall represent the decimal point for inductance values less than 10, and the other two bands shall represent significant figures. For inductance values of 10 or more, the first two bands shall represent significant figures, and the third band shall represent the multiplier. For small units, dots may be used instead of bands, when specified. The diameter of the MIL-identifier dot shall be larger than the other dots. Typical color coding examples are shown above.

Example A For L values less than 10 uH.



Example B For L values 10 uH or greater.



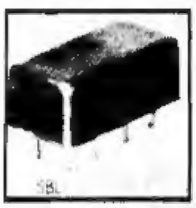
COLOR CODE TABLE

Color	Significant Figure	(1) Multiplier	Inductance Tolerance (Percent)
BLACK	0	1	
BROWN	1	10	
RED	2	100	
ORANGE	3	1,000	
YELLOW	4		
GREEN	5		
BLUE	6		
VIOLET	7		
GRAY	8		
WHITE	9		
NONE (2)			± 20
SILVER			± 10
GOLD	DECIMAL POINT		± 5

(1) The multiplier is the factor by which the two significant figures are multiplied to yield the nominal inductance value.
(2) Indicates body color.

Double Balanced Diode Mixers

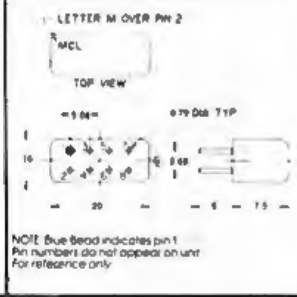
Mini-Circuits

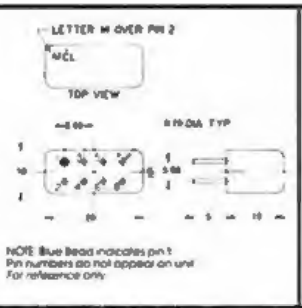


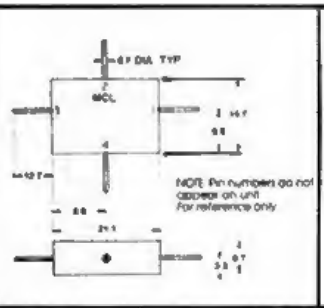
Pin Out's

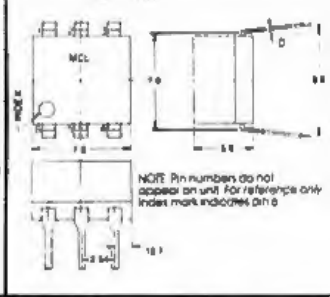
STOCK #	TC05, TC12	TC08	TC13	TC14	TC16
Lo	8	8	8	3	1
RF	1	3,4*	1	1	4
IF	3,4*	1	1	1	4
GND.	2,5,6,7	2,5,6,7	2,5,6,7	2	2,3,6
Case Ground	*Isolated*	2,5,6,7	2,5,6,7	2	*Insulated*

* Must be connected Externally





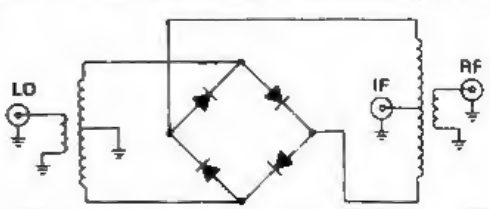




STOCK NO.	MODEL NO.	FREQUENCY MHz LO/RF f_L-f_U	FREQUENCY MHz IF	CONVERSION LOSS dB Mid-Band Typ	CONVERSION LOSS dB Mid-Band Max	CONVERSION LOSS dB Total Range Typ	CONVERSION LOSS dB Total Range Max	LO-RF ISOLATION, dB L Typ	LO-RF L Min	LO-RF M Typ	LO-RF M Min	LO-RF U Typ	LO-RF U Min	LO-IF ISOLATION, dB L Typ	LO-IF L Min	LO-IF M Typ	LO-IF M Min	LO-IF U Typ	LO-IF U Min	L O INJECTION
TC05	SBL-1	1-500	DC-500	5.5	7.0	6.5	8.0	60	45	45	35	30	25	45	35	40	25	30	20	
TC06	SBL-1X	10-1000	5-500	6.0	7.5	7.0	8.0	50	40	40	30	28	28	50	45	40	35	35	25	
TC12	SBL-3	025-200	DC-200	5.5	7.5	6.0	8.5	55	50	45	30	35	25	45	35	40	30	30	20	+7dBm
TC11	PAM-42	2.0-4.2GHz	DC-1.3GHz	–	–	7.0	8.5	25 (typ) 17 (min)	–	–				–	–	18 (typ) 10 (min)	–	–		
TC13	SRA-220	05-2000	05-500	6.0	8.0	7.0	9.0	25	20	40	30	30	20	25	20	40	30	25	15	+10dBm
TC16	ASK-1	1-600	DC-600	5.5	7.0	6.0	8.5	50	30	35	25	30	20	45	35	30	20	25	15	+7dBm

These low cost double-balanced mixers have been selected as being the most popular and widely used types. Designed for injection levels of +7dBm (5mW) these mixers offer good conversion loss performance with a 1dB signal compression point of +1dBm. Conversion loss performance is maintained within reasonable limits over the range of injection levels from +4dBm to +10dBm.

ABSOLUTE MAXIMUM RATINGS— Operating & storage temperature —55°C to+100°C ; **Pin temperature** +260°C ; **RF power** 50 mW ; **Peak IF current** 40 mA



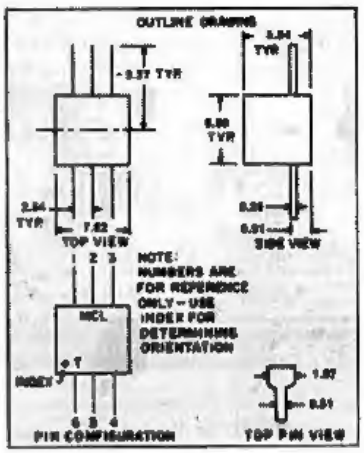
RF Transformers Plastic Case T-series

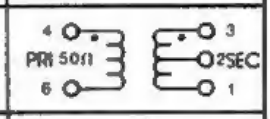
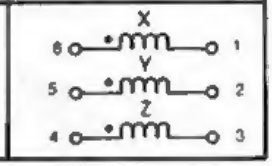
Mini-Circuits

Obtain 180° phase reversal of signals
Amplifier interstage impedance matching
Input matching amplifiers for optimum noise figure
Vectorially combining two signals
Broadband impedance matching of equipment or components — Signal sampling

The **T-series** of micro-miniature wide-band **RF Transformers** cover the frequency range from 10 KHz to 800 MHz. They operate with impedence levels from 12.5 ohms to 800 ohms and provide very low insertion loss, typically less than 0.5db. The **T series**, although specified for a 50 ohm primary impedance, may be operated with a primary impedance as low as 12.5 ohms. The impedance matching ratio is essentially constant over the primary impedance range. The frequency response may change somewhat.

Absolute power ratings Total input power 0.25 watts ; **Operating and storage temperature** —20°C to +85°C ; **Pin temperature** 260°C for 10 seconds. **Weight** 0.04 grams.



STOCK NO.	MODEL NO.	IMP. RATIO	FREQ for Insertion Loss 1db	2db	3db	
TC01	T1-1	1 : 1	2-50mHz	0.35-200mHz	0.15-400mHz	
TC02	T4-6	4 : 1	0.1-100	0.05-150	0.02-200	
TC03	T9-1	9 : 1	2-40	0.3-150	0.15-200	
TC04	T16-1	16 : 1	5-20	0.7-80	0.3-120	
TC10	T1-1T	1 : 1	0.2-80	0.08-150	0.05-200	
TC09	T2-1T	2 : 1	0.5-50	0.1-100	0.07-200	
TC08	T4-1	4 : 1	2-100	0.35-300	0.2-350	
TC11	T-622	1	5-80	0.5-100	0.1-200	

Broadband Directional Coupler Series PDC

Mini-Circuits

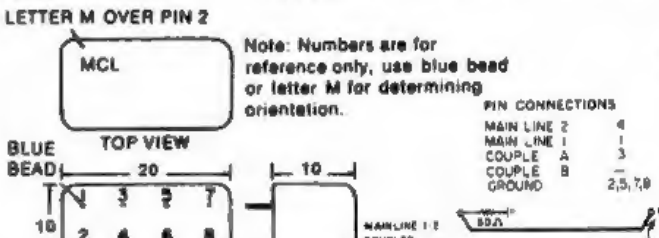
Measure incident and reflected power to determine VSWR
Signal sampling — S Parameter measurement
Signal injection — Signal generator/Oscillator leveling
Power flow monitoring

The **PDC** series directional couplers are economically priced while covering the frequency range 0.5 to 500 MHz. They offer main line losses as 0.1 dB and high directivity of up to 35dB. Packaged within an RFI shielded metal enclosure and hermetically-sealed header, these high performance units have there pins oriented on a 0.2" (5.08mm) grid. Ruggedness and durability are built into the PDC series. Only well matched and ruggedly constructed trasmission line transformers are used. Internally every component is bonded to the header and case with silicone rubber to provide super reliable protection against shock, vibration and acceleration.

This unit has become an industry standard thoughout the world and is belived to be the number one volume leader. Used by all branches of the department of defence, NASA, FAA and every major communications company.

High reliability is associated with every PDC series directional coupler. Every production unit is 100% tested and every unit must pass our rigid inspection and high quality standards. Our one year guarantee applies to these units.

Made in the USA by MINI-CIRCUITS Laboratory. **Weight** 5.2 grams ; **Operating and Storage Temperature** —55°C to +100°C ; **Pin Temperature** 260°C for 10 seconds



STOCK NO.	MODEL NO.	FREQUENCY MHz f_L–f_U	COUPLING dB Nom.	Flatness	MAINLINE LOSS dB L Typ Max	M Typ Max	U Typ Max	DIRECTIVITY dB L Typ Min	M Typ Min	U Typ Min	VSWR Typ	POWER INPUT, W L Max	MU Max
TC07	PDC-10-1	0.5—500	11.5±0.5	±0.8	.85	1.0	.85 1.0	1.2 1.5	35 25	32 25	22 15	1.2	1.5	3